KNOWLEDGE OF MATERNAL NUTRITION, ATTITUDE AND PRACTICES AMONG NURSES WORKING AT KENYATTA NATIONAL HOSPITAL, KENYA

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DEDICATION

To my dear husband Francis Wangusi and my brother Richard and his wife Ruth for their love, support, and encouragement throughout the development of this dissertation.

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LIST OF ACRONYMS

ACOG	American College of Obstetrics and Gynaecologists
ACSM	Advocacy Communication and Social Mobilization
ANC	Ante Natal Clinic
BCC	Behaviour Change Communication
BFHI	Baby Friendly Hospital Initiative
BMI	Body Mass Index
BScN	Bachelor of Science in Nursing
CED	Chronic Energy Deficiency
CPD	Continuous Professional Development
DHA	Decosahexaenoic Acid
ERC	Ethics and Research Committee
FAO	Food Agricultural Organization
IEC	Information Education Communication
IFAS	Iron Folic Acid Supplements
IUGR	Intra Uterine Growth Retardation
IYCF	Infant and Young Child Feeding
KAP	Knowledge Attitude and Practices
KDHS	Kenya Demographic Health Survey
KNBS	Kenya National Bureau of Statistics
KNH	Kenyatta National Hospital
KNW	Kenya Nursing Workforce
KSATN	Kenya Situation Analysis for Transform Nutrition
LBW	Low Birth Weight
MDG	Millennium Development Goal

MIYCN	Maternal, Infant and Young Child Nutrition
MOH	Ministry of Health
MScN	Master of Science in Nursing
MUAC	Mid Upper Arm Circumference
NKS	Nutrition Knowledge Score
PMTCT	Prevention Mother to Child Transmission
RH	Reproductive Health
ROK	Republic of Kenya
SNNPR	Southern Nations, Nationalities and People's Region
TPB	Theory of Planned Behaviour
UNICEF	United Children’s Education Fund
UNISA	University of South Africa
UON	University of Nairobi
USA	United States of America
WB	Well Baby
WHO	World Health Organization
WW	Well Woman

OPERATIONAL DEFINITIONS

Nutrients	refers to substances in food that are essential for energy, growth, normal functioning of the body, and maintenance of life
Nutrition	refers to the process by which food is eaten, digested and utilized in the body for production of energy, growth, maintenance and regulation of body functions
Maternal nutrition	refers to the nutritional needs of women during the antenatal and postnatal period (when they are pregnant and breastfeeding) and also the pre-conceptual period
Nutritional assessment	refers to the process of estimating the nutritional reserves of an individual at a given point in time using proxy measurements of nutritional adequacy
Nutritional status	refers to the condition of the body in those respects influenced by the diet; the levels of nutrients in the body and the ability of those levels to maintain normal metabolic integrity
Malnutrition	refers to a condition of health caused by an imbalance in nutrient intake and characterized by a depletion or excess accumulation of nutritional reserves
Attitude	refers to the way nurses feel and think about maternal nutrition and their opinion about providing nutrition care to pregnant women
Knowledge	refers to the theoretical and practical understanding of maternal nutrition information by the nurses
Practice	refers to the actual application of knowledge and skills in maternal nutrition by the nurses in their day-to-day work

ABSTRACT

Introduction: Maternal nutrition is essential from conception and throughout pregnancy as it is a critical factor in child survival, growth and development. Nurses are well placed to provide nutrition education during pregnancy by nature of their roles in healthcare. The main objective of this study was to establish the knowledge of maternal nutrition, attitude, and practices and their relationships among nurses working at the Reproductive Health Department, Kenyatta National Hospital.

Research Methods: This was a cross-sectional analytical study involving 171 nurses working at the Reproductive Health department, Kenyatta National Hospital in Kenya. Ethical approval was obtained and a 53-item validated semi-structured questionnaire was used to collect data. Key informant interviews and direct observations were used to collect qualitative data. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 22. Socio-demographic and nutrition training background data was analyzed using descriptive statistics. Pearson's Chi-square test, Kruskall-Wallis test and odds ratio were used to test for associations. Independent t-tests, analysis of variance, and Mann Whitney U test were used to test group means. Multiple linear regression analysis was used to determine the relationships between the continuous dependent variable and independent variables.

Results: Majority of the nurses (77.8%) were females with a mean age of 39.5±10 years. More than two thirds (71.3%) were diploma holders and majority (88.9%) had covered a topic on maternal nutrition while (77.2%) had attended a short professional course including maternal nutrition. The mean maternal nutrition knowledge score of the nurses was 9.46±2.26 out of 15 while the mean attitude score was 34.66±4.72 out of 40. There was a significant association between knowledge and attitude of the respondents. Respondents who had adequate knowledge on maternal nutrition were more than **five times** more likely to have a positive attitude towards maternal nutrition care as compared to those with inadequate maternal nutrition knowledge (OR=5.42, CI[3.94-7.45], p=0.007). Further analysis showed that attitude **(p<0.001)** and length of short professional trainings (**p<0.002)** were significant predictors of maternal nutrition knowledge.

Conclusion: The study has shown that the knowledge of the nurses on maternal nutrition is above average. They have a positive attitude towards maternal nutrition care but their practices seem to contradict their knowledge and attitude revealing a missing link. The study findings provide a need for fostering teamwork, providing job aids, and incorporating on-job-training approaches and supportive supervision in maternal nutrition care so as to holistically enhance knowledge, attitude and practice skills development among nurses which in turn will improve quality of maternal nutrition care at Kenyatta National Hospital.

CHAPTER 1: INTRODUCTION

1.1 Background Information

Maternal nutrition is a requirement for a successful pregnancy outcome and hence critical to both mother and her baby. Current evidence underscores the importance of maternal nutrition at conception and throughout pregnancy and lactation as fundamental to child survival, growth and development (Lassi et al., 2013).

Nutrition education during the course of pregnancy has been linked to positive outcomes (Everette, 2009). The nurse forms the primary link between the patient or client and the healthcare system and thus is in the most appropriate position to provide nutrition information. Midwives play an important role in nutrition education which is increasingly being recognized (Arrish et al., 2014).

A survey in the United States concluded that nutrition education in undergraduate and graduate nursing schools was inadequate (Stotts et al., 1987). Without an appropriate nutritional base, nurses may not be able to provide nutritional care, (Kowonko et al., 1999). The nursing curriculum in Kenya covers nutrition but only to a small extent. The government of Kenya through the Ministry of Health (MOH) addresses this inadequacy by regularly conducting training programmes on nutrition covering various aspects such as Maternal, Infant and Young Child Nutrition (MIYCN). The national policy on Iron and Folic Acid Supplements (IFAS) provides guidelines for healthcare workers on intake of IFAS by pregnant women. The MIYCN policy (2013) provides guidelines on appropriate nutrition practices that promote maternal, infant and young children's health and survival.

The Kenya National Nutrition Action Plan (2012-2017) enumerates improving knowledge, attitudes and practices on good nutrition as one of its strategies to improve nutrition care practices in the lifecycle. Some of the priority areas of the plan include carrying out assessments on the status of nutrition knowledge, attitude and practices in the general population among others (Republic of Kenya, 2012).

In 1992, the Government of Kenya partnered with Wellstart Lactation Management Program of San Diego, California, USA to start a Lactation Management Training Centre within the Reproductive Health (RH) department at Kenyatta National Hospital (KNH) as a joint venture between MOH, KNH, and the University of Nairobi (UON) (Mirie, 2001). The objective of this programme was to train multidisciplinary teams of health professionals in lactation management so as to improve their knowledge, skills, attitudes and practices in maternal, infant, and young child nutrition. Since inception of the programme, three trainings are held annually with between 25 to 30 health workers working in RH department and Paediatric and Child Health trained per session. To date, the Centre, has trained over 1,800 health workers, 75% of who are nurses.

1.2 Problem Statement

In Kenya, nutritionists and dieticians are the healthcare professionals who are trained and registered to assist the general population including groups with special nutritional needs such as pregnant women to achieve optimal health by providing nutrition information and dietary advice. However, due to the limited number and availability of nutritionists and dieticians in health facilities that provide maternal health services, majority of pregnant women do not have access to them. Therefore, women with low risk pregnancies would more commonly have contact with a midwife only, throughout the prenatal period.

Nevertheless, it is increasingly being recognized that nurses play an important role in educating pregnant women on nutrition during pregnancy (Arrish et al., 2014). Reports show that pregnant women perceive nurses as having the necessary expertise in maternal care and are also a trusted source of nutrition information and advice (Szwajcer, 2009), yet some studies have reported conflicting results about the ability of nurses to provide adequate or reliable nutrition advice (Mulliner et al., 1995). Contrary to the expectations of the women in their care (Bondarianzadeh et al., 2007) some nurses lack the essential knowledge and skills (Barrowclough and Ford, 2001). At present, data on the knowledge of maternal nutrition, attitudes and practices of nurses who provide care to pregnant women is limited in Kenya and therefore necessitates a need to investigate this.

1.3 Justification

The nutritional status of infants and young children is closely linked to the health of the mother before, during and after pregnancy (Marinda, 2006). It is well known that maternal nutrition not only affects fetal development, but also their risk to chronic diseases later in adulthood (Koletzko, 2012; Silveira et al., 2007). The critical "window of opportunity" commonly referred to as the "first 1000 days" occurs from conception until 24 months of age. The right nutrition during this critical window can have an extremely serious impact on a child's ability to grow, learn, and become economically empowered thereby boosting productivity and enhancing economic prospects for families and the society at large. Thus nurses caring for women during this critical time have a unique opportunity to impact on the health of the mother, child and community by encouraging good nutrition (Barker, 1993; Barker et al., 1995).

The implementation of the free maternity services policy by the Government of Kenya significantly increased the number of mothers accessing maternal health services in all public health facilities (Boubonnais, 2013). However, most of the health facilities in Kenya do not have adequate staffing of nutritionists and in some cases none at all to provide nutrition counselling services to clients in need. Nurses are instead relied upon to provide health and nutrition education and advice to mothers. Research is needed to assess the Knowledge Attitude and Practices (KAP) of nurses on maternal nutrition and utilize the findings to improve maternal nutrition care practices and service delivery in public health facilities in Kenya. Kenyatta National Hospital provides an appropriate setting to undertake this study since it is a national referral hospital with a highly trained and qualified multidisciplinary workforce.

1.4 Aim of the Study

This study aims to contribute towards improved maternal nutrition care services at public health facilities in Kenya.

1.5 Purpose of the Study

The purpose of the study is to generate data that may be used to improve and/or develop

policies, guidelines, and protocols focused on enhancing the quality of knowledge, attitude and practices in maternal nutrition care at public health facilities in Kenya.

1.6 Objectives

1.6.1 Main Objective

To establish the knowledge of maternal nutrition, attitude, and practices and their relationships among nurses working at the Reproductive Health Department, Kenyatta National Hospital, Nairobi, Kenya.

1.6.2 Specific Objectives

1) To determine the socio-demographic characteristics of the nurses
2) To determine the nutritional training background of nurses
3) To determine the knowledge of the nurses on maternal nutrition
4) To determine the maternal nutrition care practices of nurses
5) To determine the attitude of nurses towards maternal nutrition care
6) To establish the factors that predict the knowledge of maternal nutrition, attitudes and practices of nurses

1.7 Research Questions

1) What are the socio-demographic characteristics of nurses working at the Reproductive Health Department, KNH
2) What is the nutritional training background of nurses at working at the Reproductive Health Department, KNH?
3) What level of knowledge in maternal nutrition do nurses working at the Reproductive Health Department, KNH have?
4) How well do nurses working at the Reproductive Health Department, KNH carry out maternal nutrition care practices?
5) What is the attitude of nurses working at the Reproductive Health Department, KNH towards maternal nutrition care?

6) Is there a relationship between maternal nutritional knowledge, attitude, and practices of nurses working at the Reproductive Health Department, KNH?

1.8 Null Hypothesis

There is no significant association between the knowledge of maternal nutrition, attitude, and practices of nurses working at the Reproductive Health Department, KNH that improves the quality of maternal nutrition care services at public health facilities in Kenya.

1.9 Theoretical and Conceptual Framework

The Theory of Planned Behaviour (TPB) provides the conceptual framework for this study. According to the theory of planned behaviour, the choices and behaviours of individuals are dictated by rational considerations (Ajzen and Fishbein, 2005). Specifically, the theory of reasoned action, which is a precursor of this theory, postulates that behaviour is determined by the intentions or otherwise the motivations or explicit plans of individuals to commit a certain act. These intentions partially reflect the extent to which individuals perceive an act as desirable or favourable, which is their personal attitudes. These attitudes reflect both cognitive beliefs about the act, such as whether they believe that act is beneficial, as well as affective evaluations, such as whether they feel that it is important (Ajzen, 1991).

Additionally, the degree to which significant individuals, such as friends or colleagues perceive particular behaviour, referred to as subjective norms, also affects intentions (Ajzen, 1991; Ajzen & Fishbein, 2005). The perceived importance or relevance of these friends or colleagues affects the extent to which their approval will shape intentions. For example, the beliefs of managers might be more likely to shape the intentions to engage in behaviours that relate to work life (Ajzen, 1991).

According to the theory of planned behaviour, perceived behavioural control, which is the extent to which individuals feel they can engage in certain behaviours, impinges on their intentions and behaviours (Ajzen, 1991). Perceived behavioural control comprises two main components. First, it depends on the degree to which individuals conceptualize themselves as

sufficiently knowledgeable, skilful, disciplined, and able to perform some act, called internal control, which overlaps with the concept of self efficacy (Kraft et al., 2005). Second, it also depends on the extent to which individuals feel that other factors, such as the cooperation of colleagues, resources, or time constraints, could inhibit or facilitate the behaviour, called external control (Kraft et al., 2005).

Furthermore, intentions to perform some act do not always culminate in this behaviour. Perceived behavioural control is partly related to actual behavioural control which in turn affects the extent to which intentions are associated with the corresponding behaviours (Armitage and Conner, 2001). Perceived and actual behavioural control can sometimes contrast, such as when individuals are oblivious to factors that prevent or facilitate the intended behaviour.

The theory of planned behaviour has often been applied to predict the likelihood of health behaviour (Hardeman et al., 2002), condom use (Albarracin et al., 2001), dieting (Bagozzi et al., 2004), driving (Conner et al., 2003), product choice, supportive behaviours, and voting (Cooke and Sheeran, 2004). The theory has also been applied to a broad array of cultures or continents, including Africa (Fekadu and Kraft, 2001, Molla, Astrom, and Berhane, 2007).

The Theory of Planned Behaviour has been adopted to design the framework for this study as depicted in the illustrated models (Appendix 6). The influential factors in Azjen's TPB are depicted as the independent variables in this study. They comprise the sociodemographic characteristics of the nurses, namely; age, sex and marital status and the nutrition training background factors which include; academic qualifications, nursing experience at the reproductive health department, topic on maternal nutrition covered in nursing training, attended short professional course training addressing maternal nutrition, length of short professional course, regularity of short professional trainings addressing maternal nutrition, duration since last attended a professional training session on nutrition, main source of information and reference on maternal nutrition, knows where and how to find information and reference materials on maternal nutrition, and knowledge on regular update of main sources of information and reference materials used.

The three predictor variables in Azjen's TPB that impact on an individual's intent to do an act are represented by the nurses' maternal nutrition knowledge, attitude and practices. The resultant behavior patterns are indicated by the outcome variables which is reflected by adequate or inadequate knowledge, positive or negative knowledge, or recommended or inappropriate practices of the nurses (Appendix 6).

1.10 Expected Benefits from the Study

- The findings of this study will provide baseline information on knowledge, attitude, and practices of nurses on maternal nutrition to other researchers and institutions.
- The study findings will determine gaps in knowledge of maternal nutrition, attitude, and practice of nurses and recommend approaches to address them.

CHAPTER 2: LITERATURE REVIEW

2.1 Maternal Nutrition Training Background and Reference Sources for Nurses

There are seventy three and twenty one approved diploma and degree nursing training institutions in Kenya (NCK, 2014). At the University of Nairobi, "Nutrition and Health" is taught once in the first year of B.Sc. Nursing. The unit covers *inter alia* nutrition in growth and development, nutrition during pregnancy and lactation; Nutritional care process, Nutritional counselling, Nutritional care plans, Nutrition education principles, and teaching methods in nutrition education (UON, 2016).

Watson and Kogi-Makau (2010) undertook a pilot project aimed at building sustainable human capacity to respond to nutritional emergencies through strengthening pre- and in-service training courses. The training was conducted to nutritionists, nurses, community health officers, clinical officers and doctors and public health officers. According to the project report, only 9 universities and 4 technical institutions have incorporated nutrition into their nursing curriculum. The report further opined that there was limited nutrition assessment, and emergency nutrition programming at B.Sc. and diploma level.

In Kenya, Malezi Bora Programme targets the general public and offers free nutrition education *inter alia* to pregnant women. The MOH conducted a two and a half day training on IFAS compliance. The training targeted among other medical professionals, nurses. The training sought to disseminate the National IFAS policy; enhance the knowledge of health care workers on maternal nutrition during pregnancy and maternal anaemia; strengthen counseling skills for IFAS using IFAS Behaviour Change Communication (BCC) job aids and materials; improve commodity management of IFAS commodities through good inventory management practices; and strengthen support supervision for IFAS through effective monitoring and evaluation (RoK, 2013).

The National MIYCN Policy Guidelines (2013) and the National Strategy for MIYCN (2012-2017) provide a framework to guide and facilitate standardized implementation of maternal, infant and young child nutrition services at national, county, and community levels aimed at

improving MIYCN practices in Kenya. The policy guidelines identify evidence-based practices that should be undertaken to strengthen the capacity of healthcare services, communities, and stakeholders to improve the nutritional status of women, infants and young children in Kenya. This is accompanied by MIYCN National Operational Guidelines for Health Workers (2013) that provide guidance for timely and quality health and nutrition interventions for mothers, infants, and children.

Stotts et al., (1987) assessed the nutrition content in the nursing curricula in the United States of America. The study aimed at establishing whether nurses in schools of nursing were being adequately educated on the nutritional needs of patients. The study found that the nutrition content at the graduate level was inadequate. The study recommended revision of the nutrition content and increased practical clinical nutrition experience in both undergraduate and graduate nursing training.

Feresin and Sonzogno (2007) examined the insertion of nutrition into the nursing curricula in Sao Paolo. The study evaluated six units of nutrition taught in undergraduate nursing. The study noted that the nutrition courses taught in nursing were highly theoretical and recommended practice right from the first year of the course. The study also revealed that the teaching method of nutrition in nursing and evaluation methods used were inadequate. The study recommended more holistic evaluation to assess not only retention but also the overall learning process. Further, the authors recommended that nutrition teachers in Undergraduate Nursing Courses should exchange experiences and discuss strategies that best satisfy the students' teaching and learning processes.

2.2 Knowledge of Maternal Nutrition, Attitude and Practices of Nurses

In a randomly selected sample of 77 registered midwives, Mulliner et al. (1995) used both quantitative and qualitative methods to investigate the education, knowledge and attitudes to nutrition during pregnancy. Results of the study showed that majority (86%) of the registered midwives had no formal nutrition education after qualification while nearly half (46%) had poor nutrition knowledge score and more than half of them felt inadequately qualified to provide nutrition advice especially to women with prior medical conditions, vegetarian

women, and women from ethnic or religious background. The authors acknowledged that the midwives lacked basic nutrition information despite the small sample size, but concluded that they would benefit from improving their nutrition knowledge.

A study in the United Kingdom that examined the pregnancy nutrition knowledge of 35 midwives established that the midwives had poor knowledge in areas such as recommended increase in energy requirements in pregnancy, recommended weight gain during pregnancy, women at risk of iron-deficiency anaemia, folic acid requirements during pregnancy, and initiation of folic acid supplements (Barrowclough and Ford 2010).

Szwajcer et al. (2009) conducted an in-depth exploration of both verbal and written communication practices of midwives in Holland. The authors established that nutrition information was generally provided to the women late in pregnancy when they were more interested in other issues concerning their pregnancy than nutrition education. Additionally, the study showed that although the midwives educated the women on healthy nutrition and issued them with brochures, the pregnant women rarely referred to them while at home because the midwives did not reinforce the information in the brochures.

A study by Wills and Forster (2008) examined the nutritional advice and support given to pregnant women experiencing nausea and/or vomiting by 49 midwives. The study findings showed that most (85%) midwives included some form of vitamin or herbal supplement in their advice. However, the advice lacked sound scientific evidence especially with regard to appropriate doses and potential harmful side effects of herbal remedies due to lack of evidence to guide the midwives' practice in this area. This may denote that midwives lack appropriate knowledge on maternal nutrition and may not recognize the importance for sound scientific evidence for nutrition practices as it is for their own professional practice.

On the contrary, a study in New Zealand by Elias and Green (2007) examined nutrition knowledge of 370 midwives and their perceptions of the importance of nutrition during pregnancy. The study established that less than 40% of the midwives had formal nutrition education; however, nearly 75% had received nutrition information through their midwifery

education. Most (98.4%) of the midwives indicated that nutrition was important or very important during pregnancy while 94.9% indicated they played a significant or very significant role in educating pregnant women about nutrition. The authors concluded that the midwives were knowledgeable on nutrition in pregnancy and had had a high level of confidence on educating women about nutrition.

Ilmonen, Isolauri and Laitinen (2012) investigated the nutrition education and counselling practices amongst nurses in mother and child clinics. The study employed a descriptive study design. They found that nurses considered nutrition counselling an important but challenging task in the clinics. The study established that nurses were actively involved in promotion of health and they counselled clients in the management of various disorders ranging from constipation to coeliac disease. The study noted variability in the extent to which nurses had adopted nutrition guidelines. The study recommended better collaboration with both families and healthcare professionals and an increase in resources, including time available for counselling, up-to-date educational material and clinical guidelines, as well as increased education in nutrition to improve counselling.

Huurre et al. (2006) examined practices of nutrition counselling given by nurses in well-women (WW) and well-baby (WB) clinics in Finland. The study employed a semi-structured questionnaire to collect data from nurses and clients. The study found that clinics constituted the most important source of information for mothers. Personal counselling was highly appreciated. 83% of pregnant women reported having received dietary counselling while, 99% reported that they had offered dietary counselling to mothers. The study revealed that counselling concerning allergies was targeted to reduce the risk of infant allergy by means of elimination diets.

Perumal et al. (2013) investigated the health and nutrition knowledge, attitudes and practices of pregnant women attending antenatal care clinics in Western Kenya. The study applied a community-based cross-sectional survey in the study area. The study found that 59% of the pregnant women in the survey attended Ante Natal Clinics (ANC) and scored 4.9 in the Nutrition Health Scores (NKS) out of 11. According to the study, ANC clinic visits were positively related to nutritional health levels among the pregnant women. The study

recommended a greater emphasis on program implementation of health and nutrition counselling is required to ensure effective uptake of health and nutrition knowledge, and improved dietary and food consumption practices.

2.3 Global, Regional, and National Overview of Maternal Nutrition

According to the World Health Organization (WHO), the number of absolute poor people in the world was approximately one billion with half of them being women (WHO, 2012). It is estimated that there are 300 million women within the child bearing age (15 – 44 years) that live under conditions of extreme poverty who are of particular concern from a nutrition stand point. It is worth noting that least two thirds live in rural while a third in urban settings and half of these women are in the Asian continent while a third reside in Africa and the remaining proportion live in the Middle East and Latin America (Ghassem, 2012).

According to WHO (2012) almost half a billion women worldwide are affected by some degree of nutritional anaemia and almost one third of the women in the third world are likely to be anaemic. Approximately half of these anaemic women live in Africa. Marinda (2006) indicates that major micronutrient deficiencies among women include iron deficiency anaemia, zinc and vitamin A. Slightly over half of the pregnant women in Kenya experience iron deficiency anaemia compared to 47.9% of non-pregnant women. Approximately 52% of mothers experience zinc deficiency while 40% experience vitamin A deficiency. The magnitude of micronutrient deficiencies is more significant among pregnant and lactating women. Over 50% of pregnant women experience iron-deficiency anemia compared to 47.9% of non-pregnant women or 16% of adult men while 52% of women experience zinc deficiency (Steyn et al., 2011). About 40% of women experience severe and mild forms of vitamin A deficiency (Republic of Kenya, 2011).

Iron deficiency and anaemia need to be addressed before pregnancy as they are not only associated with reduced physical capacity and increased susceptibility to infections but also an increased risk of poor maternal health and pregnancy outcomes (WHO, 2012).

According to Uthman and Aremu (2008), birth defects and mental retardation are likely to occur if folate and Iodine are deficient in the peri-conceptional period. The prevalence of folate deficiency worldwide is not well known. But it is estimated that neural tube defects occur in about 300,000 pregnancies annually and an adequate intake of folate in the peri-conceptional period would reduce the incidence by half to nearly three quarters.

There are more women in low income countries that are thin (low body mass index <18.5 kg/m^2) and short (height <145 cm) compared with those in higher income. The highest rates of women with low body mass index have been observed in the southern part of Asia followed by sub-Saharan Africa. Critically high rates (≥40%) have been reported in Eritrea and Bangladesh while serious rates (20 – 39%) have been observed in Ethiopia, Mali, Chad, Madagascar, Yemen, Nepal, and Cambodia (WHO, 2012). Additionally, at least 10% of women in Nepal, India, Bangladesh, Guatemala, Peru, and Plurinational State of Bolivia are shorter than 145cm (Ruel & Alderman, 2013).

On the contrary, an estimated 35% of women aged above 18 years globally are said to be overweight and obese (body mass index ≥25 kg/m^2 and ≥30 kg/m^2 respectively). High proportions exceeding 50% have been reported in some regions of the Americas, the Eastern Mediterranean and Europe (Uthman and Aremu, 2008). Body mass index above 25 kg/m^2 has been associated with adverse metabolic effects including elevated blood pressure, insulin resistance, and high cholesterol and triglyceride levels leading to increased risk of cardiovascular disease, type 2 diabetes and polycystic ovarian syndrome. Women, who enter pregnancy with a body mass index above 30 kg /m2, have an increased risk of weight related complications during pregnancy and child birth. They tend to retain and even increase in weight after child birth and usually deliver larger babies who are at risk of becoming obese and developing type 2 diabetes later in life (Tough et al., 2006; Ruel and Alderman, 2013).

According to Mugo (2012), nutritional status of women in the African region should be given priority, as the human welfare losses associated with maternal malnutrition are vast. Some studies have also shown that there is bidirectional causality between health and economic growth and development. Thus maternal nutrition should be prioritized as optimal nutrition

leads to better health indicators that in turn promote the economic development that Africa strives to achieve (Ruel and Alderman, 2013).

Nutritional trends for women aged 15 to 49 years in Kenya have not improved much over time. Data on nutritional status of women was first captured in the 1993 Kenya Demographic Health Survey (KDHS). It indicated that 9% of women were too thin (BMI < 18.5 kg/m^2). This increased to 12% in 1998 with a slight drop to 11% in 2003 which increased again to 12% in 2008-2009. The percentage of underweight women ranged from 3% in Nairobi County to 25% in North Eastern Kenya (Republic of Kenya, 2011).

Kenya is also increasingly faced with diet related conditions such as obesity, diabetes, cardiovascular disease and certain cancers especially in urban areas. Prevalence of overweight and obesity has risen over the years. The proportion of women aged 15-49 years who are overweight and obese was 13% in 1993 and 17.8% in 1998. This rose up to 27% in 2003 and 26% in 2008-09. This shows that not much progress has been made in reducing maternal malnutrition in the country over time (KDHS, 2008-2009).

The Kenyan government has taken several interventions to curb malnutrition in the country. In 2000, the Government developed a gender policy which outlined the government's commitment to advancing the status of women. The policy recognized the role of women in the agricultural sector and in ensuring household food security and nutrition. It was also cognizant of the fact that the maternal nutritional status can be negatively affected by how food is allocated. The report recommended that the causes of poor nutrition among pregnant and lactating women be addressed and awareness be created on the negative health implications (KSATN, 2011).

Despite these policies, large numbers of the country's population continue to face rising levels of poverty, hunger and malnutrition and women nutritional status remains unfavourable. Chronic and acute malnutrition, micronutrient deficiencies are prevalent, particularly among women in rural areas and the urban poor (KDHS, 2008-2009).

2.4 Importance of Good Maternal Nutrition Care Practices

The nutritional status of women has important implications on their own health and that of their children. Malnutrition among women is associated with vast and severe human welfare losses including impaired ability to reproduce, care for and nurture children and reduced quality of life for the women themselves. Women play an important role in safeguarding the health of family members especially the vulnerable ones other than teaching children about proper food and health habits. Her compromised nutritional status affects the health and nutrition of her family (Haileslassie, Mulugeta and Girm, 2013).

Szostak-Wegierek (2000) argues that a woman's nutritional status in the preconception period and during pregnancy may influence foetal development and the child's health in life. Low pre-pregnancy weight (BMI<19.8 kg/m^2) and inadequate weight gain during pregnancy may increase the risk of low birth weight. There is increasing evidence that persons born with low birth weight are at an increased risk of metabolic disorders including arterial hypertension, hypercholesterolemia, hyperlipidaemia, and insulin resistance later in life compared with those born with normal weight. In addition, deficiency of folate before and during pregnancy may cause neural tube defects and contribute to preterm and low birth weight deliveries.

Women who are thin with a BMI below $18.5kg/m^2$ show a progressive increase in morbidity and mortality rates. Evidence show that approximately 20% of maternal deaths results from anaemia (Pasternak et al., 2013). It has been proven that poor maternal nutrition status may decrease a woman's reproductive capacity, thus affecting fertility. Other consequences of maternal malnutrition include increased prenatal and neonatal mortality, intrauterine growth retardation (IUGR) resulting to low birth weight (LBW) infants, brain damage, miscarriage and stillbirths. In HIV positive women, malnutrition and deficiencies in specific micronutrients, such as vitamin A, are associated with a greater risk of HIV transmission from mother to child. Anaemia also increases viral shedding in the birth canal and consequently, mother to child transmission (Salisbury and Robertson, 2013).

According to Lindsay et al. (2012), micronutrient deficiencies affect many women of reproductive age and are associated with adverse health effects. Anaemia is a key indicator of maternal malnutrition. Maternal anaemia increases the risk of dying during delivery including moderate cases. It is estimated that iron-deficiency anaemia and stunting in women contributes to 20% of maternal mortality annually, thus adding 115,000 deaths to the total maternal deaths from obstetric complications. Iron supplementation during pregnancy is essential in the prevention of LBW while calcium has a protective role against pregnancy hypertension and preterm delivery (Schumer et al., 2014).

In addition, iodine deficiency disorders can result in serious and irreversible effects on brain development and cognitive function of children manifested vas cretinism, and can lead to stillbirths, early neonatal mortality and miscarriages. In developing countries, high fertility rates, closely spaced pregnancies, and repeated pregnancies further exacerbate the social and health problems that come along with such micronutrient deficiencies. Evidence shows that poorly nourished young girls are less likely to reach menarche by two years compared to well-nourished ones. (Imhoff-Kunsch and Martorell, 2012).

Pre pregnant BMI and weight should be established to determine the recommendations for weight gain and help with setting pregnancy goals. The appropriate weight gain recommendations should be communicated to the pregnant women taking into consideration individual variations (Walker, 2007). The primary healthcare provider should regularly monitor weight gain and progress of the pregnant women to assist them gain within their target range.

Women who surpass the recommended weight gain should be encouraged to continue gaining weight at the appropriate rate of gain according to their pre-pregnancy BMI (Health Canada, 2009). These women will need additional post-partum support to lose the extra weight gained in pregnancy and those who gain excess or not enough weight should be referred to a qualified nutritionist or dietician (Health Canada, 2009).

2.5 Causes of Poor Maternal Nutrition

The health of women and nutritional well-being in low income settings is largely affected by poor diet, heavy workload, many pregnancies, prolonged breastfeeding, repeated exposure to disease and limited access to appropriate healthcare which are also known as the immediate causal factors (Hambidge et al., 2014).

According to Salisbury and Robertson (2013), the underlying causes of under nutrition include household food insecurity, inadequate feeding and caring practices, unsafe water, and poor hygiene and sanitation services. Most of Kenya's households rely on diets that lack dietary diversity, while nearly a third of Kenyans are chronically food insecure and up to 4 million people require food assistance at any given time. This compromises the required daily caloric and nutritional intake of many families. Unprecedented hikes in food prices further restrict food availability especially by the poor (Shrimpton, 2012).

2.6 Nutritional Requirements during Pregnancy

2.6.1 Macronutrient Requirements

Macronutrients are nutrients such as carbohydrates, proteins, and fats which are converted into energy to be utilized by the body for essential functions and perform physical tasks. They are obtained from a variety of food sources including cereals and grains, meat and legumes, nuts and oil seeds among others. During pregnancy, macronutrients provide the energy required for the woman's physiological needs and fetal growth (Brion et al., 2010). Therefore macronutrient requirements increase during pregnancy because of the growing baby as well as the woman's own needs. Increasing energy intake accordingly is important for optimal outcomes for both the woman and the growing baby. Protein requirements during pregnancy increase to 1.1 g/kg/day to cater for fetal growth and breastmilk production. The protein source may be critical as the quantity. However, some evidence suggests that protein requirements can be safely met even by vegetable sources alone.

Energy needs during pregnancy are currently estimated to be the sum of the total energy expenditure of a non-pregnant woman plus the median change in total energy expenditure of 8 kcal per gestational week plus the energy deposition during pregnancy of 180 kcal per day. Extra energy intake is recommended only in the second and third trimesters because total energy expenditure does not change greatly and weight gain is minimal in the first trimester. However, during the second and third trimesters, an additional 340 and 450 kcal respectively is recommended (Blumfield et al., 2012).

While women are generally disadvantaged in having a poor diet and limited access to adequate healthcare services, this is further compounded by demands for physical work and reproduction. The average daily energy requirements of moderately active women who are not pregnant or lactating is about 2200. Additional demands for pregnancy and lactation are between 350 to 500 kcals or an increase of 15-20% (Schumer et al., 2014).

2.6.2 Micronutrient Needs

Pregnancy is associated with increased nutritional requirements occasioned by the physiologic changes of the woman and the metabolic demands of the fetus (Ramakrishnan et al., 2012). For a healthy pregnancy, good nutrition before conception is essential. Folic acid supplementation during the peri-conceptional period for instance, significantly reduces the risk of neural tube defects. Thus, a daily allowance of 400 mcg is recommended for all women planning to conceive. A healthy well balanced diet during pregnancy is vital to supply essential micronutrients to the developing fetus. In addition to folate, supplementation of iron is also needed to meet the increasing demand during pregnancy. Generally, IFAS is universally recommended for women during pregnancy. Nevertheless, many healthcare providers recommend that pregnant women take a daily multivitamin-mineral supplement that contains iron and folate to ensure that all micronutrient requirements are met (Pasternak et al., 2013).

For pregnant and lactating women aged 14 to 50 years, the recommended dietary allowance for folic acid is 600 mcg/day. On the other hand Riboflavin has a recommended dietary allowance of 1.4 mg/day (Imdad and Bhutta, 2012). Further, the recommended dietary allowance for Calcium is 1,300 mg/day, that of Iodine is 220 mcg/day and that of Iron is 27 mg/day. On the other hand, the adequate intake of Sodium is 1,500 mg/day and that of

Potassium is 4,700 mg/day. Pregnant women also require increased amounts of Vitamin A, Vitamin B6, Vitamin B12, Vitamin C, Vitamin D, Vitamin E, Vitamin K, Biotin, Niacin, Pantothenic Acid, Thiamin, including minerals and trace elements such as Chromium, Copper, Fluoride, Magnesium, Manganese, Molybdenum, Phosphorus, Selenium, Zinc and Choline.

2.7 Critique of Methodologies Used in KAP Studies of Nurses on Maternal Nutrition

Knowledge refers to the theoretical and practical understanding of maternal nutrition information by the nurses in this study. According to Bloom (1956), knowledge has four constructs: factual knowledge, conceptual knowledge, procedural knowledge and metacognitive knowledge. Open-ended and multiple-choice format questions are two of the most prevalent forms of questions used to measure text comprehension and learning in educational and research settings (Ozuru et al., 2013). Kaliyaperumal (2004) recommends the use of open-ended questions rather than multiple choice questions. He opined that multiple-choice answers could result in guessing and therefore give a false impression of the knowledge of the population. Ozuru et al.'s (2013) study on comprehension assessment by open ended versus multiple choice questions concluded that open ended questions were appropriate for self explanation assessments while multiple choice questions were appropriate in assessing prior knowledge.

In this study, knowledge levels were assessed using multiple-choice questions. It is appreciated that multiple answer questions may result in non-response where the respondent feels that their answer is not among the choices provided; however, since the questions asked in this study required only one right answer, this limitation does not influence the effectiveness of the multiple choice questions. Additionally, since the study determines the prior knowledge of the respondents on maternal nutrition, multiple choice questions are considered more appropriate.

Attitude determines how people feel toward maternal nutrition in this study. When assessing attitude, two aspects are analyzed: direction (positive/negative, for or against) and intensity (strength of the feeling) (Edwards, 1957). Scales applied in scoring attitude include the Likert

scale, the Thrustone scale, the Bogardus' Social-distance Scale, Guttman's Scalogram and the Semantic Differential (Wimmer and Dominic, 2014). The Likert scale uses a five-point continuum: 1=strongly agree; 2=agree; 3=undecided; 4=disagree; and 5=strongly disagree to rate opinion statements (Hess and Polt, 1960). The semantic differential scale uses a series of bipolar adjectives such as fair-unfair, pleasant-unpleasant, good-bad, clean-dirty, valuable-worthless (Snider and Osgood, 1969). Bogardus' Social-distance Scale commonly used to assess attitude towards ethnic groups is based on the premise that a respondent who admitted a stimulus person to a particular relationship would also admit him/her to all other relationships (Edwards, 1957). Guttman's Scalogram uses a one-dimensional scale on set of statements related to the attitude in question and arranged in increasing order of difficulty of acceptance (Webb et al., 1966). The Thrustone scale uses an eleven-point continuum to rate opinions selected by judges (Thrustone, 1929). The Thrustone scale is rarely used because it is time consuming and biased to the judges' opinions.

The Likert scale is the most commonly used scale; it is easy to use and is not time consuming. However, the Likert scale is criticized on the grounds that it assigns the same weight to all the items regardless of intensity. In regard to KAP, Khan et al. (2014) used a 5-point Likert scale (strongly agree, agree, neutral, agree, strongly agree) to assess the attitude of students in tertiary institutions toward Osteoporosis. Maina et al. (2010) used a 4-point Likert to assess the attitude of community members towards diabetes. Masuku and Lan (2014) used a 4-point Likert scale on 12 items measuring attitude towards nutrition. The 4-point Likert scale is preferred to the 5-point scale as it rules out neutrality and ambiguity in regard to attitude. In this study, attitude was assessed using a 4-point Likert scale omitting the neutral response to discourage indecisiveness among the respondents.

Practice assesses the observable actions of nurses in regard to maternal nutrition. KAP manual on assessing practice in nutrition recommends four methods: dietary diversity (quality of the whole diet); intake of specific foods; frequency of intake of specific foods; and specific observable behaviors. Sheriff et al. (2008) used 6 practice items assessed on a 4 point-scale, ranging from 'almost everyday' to 'never' to determine the practice of nutrition education intervention among primary school children. Some of the questions were also open ended. In this study, practice was assessed using multiple response questions and open-ended

questions. The open-ended questions ensured that the respondents answered freely without being confined to imposed answers. Direct observations were also be used to confirm the actual nutrition care practices of the nurses.

The current study employed an interviewer administered and self-reporting semi-structured questionnaire. It is however noteworthy that responses to self-report techniques are under the conscious control and voluntary distortions of the respondent.

2.8 Gaps in Knowledge on KAP Studies of Nurses on Maternal Nutrition

Nutrition education during the course of pregnancy has been linked to positive outcomes (Everette, 2009). In Kenya, the nutritionist and dietician is the healthcare professional that is trained and licensed to provide nutrition education and dietary advice to populations to achieve optimal health but their availability is very limited in most health facilities. The nurse forms the primary link between the patient or client and the healthcare system and thus is in the most appropriate position to provide nutrition information by nature of their roles in healthcare. Midwives play an important role in nutrition education which is increasingly being recognized (Arrish et al., 2014). Reports show that pregnant women perceive midwives to have the necessary expertise in the care of women and are also a trusted source of maternal information and advice (Szwajcer, 2009). However, the ability of nurses to provide nutritional care to patients may be hampered by both numerous tasks that instead take priority and their level of knowledge, skills, and attitudes. Some studies have reported conflicting results about the ability of nurses to provide adequate or reliable nutrition advice (Mulliner et al., 1995; Barrowclough and Ford, 2001; Bondarianzadeh et al., 2007). There is little published data on the knowledge of maternal nutrition, attitude and practices of nurses in developing countries such as Kenya. Most of the information available is mainly from the developed world necessitating a need for this data in Kenya.

CHAPTER 3: METHODOLOGY

3.1 Study Area and Site

The study was carried out at the Kenyatta National Hospital's Reproductive Health (RH) department. Kenyatta National Hospital is a national teaching and referral hospital located about 2 km from the capital city of Nairobi, Kenya. KNH has 50 wards and 22 out-patient clinics among other specialized units. The Reproductive Health department was formerly called "Obstetrics and Gynaecology" before its name was changed to the latter by the Hospital management with effect from 22nd October 2012. It comprises 6 wards and 2 outpatient clinics and a Youth Centre with a total of 205 nurses deployed in the various wards and clinics. Wards GFA, GFB and 1A are obstetric wards while Labour ward is the delivery unit. Ward 1D and 1B are gynaecology wards while clinic 18 provides ante natal services and clinic 66 is for family planning services. The Youth Centre provides support services associated with adolescent and young adult challenges. The daily ward bed occupancy stands at an average of 300 patients while the clinic attendance ranges between 100 and 120 patients per day of who 60 are antenatal mothers.

3.2 Study Design

A cross-sectional analytical study was undertaken to assess the knowledge of maternal nutrition, attitude, practices and nutrition training background among nurses working at the reproductive health department, KNH.

3.3 Study Population

The study population comprised nurses providing reproductive health services at KNH at the time of the study.

3.4 Inclusion Criteria

- Male or female qualified nurses
- Nurses deployed to the RH department and had worked there for at least 3 months prior to the study
- Nurses who were on duty and willing to participate in the study

3.5 Exclusion Criteria

- Nurses who declined to participate in the study
- Nurses who were absent during the study
- Nurses who were not deployed to the RH department or had worked there for less than 3 months prior to the study

3.6 Sampling Method and Sample Size

An exhaustive survey including all the 205 nurses in the Reproductive Health (RH) department was used in this study. The sampling frame consisted of a list of all nurses working within the six wards and three clinics (Table 1) at the RH department, KNH but a total of 171 nurses participated in the actual study, hence formed the study sample.

Table 1: Sampling Frame

REPRODUCTIVE HEALTH UNITS	TOTAL NUMBER OF NURSES	ACTUAL SAMPLE SIZE (N=171)
OBSTETRIC WARDS		
1A	20	16
GFA	20	18
GFB	21	17
LABOUR WARD	77	60
GYNAECOLOGY WARDS		
1B	20	16
1D	23	22
CLINICS		
CLINIC 18 – ANC / OUTPATIENT	9	9
CLINIC 66 – FAMILY PLANNING	10	8
YOUTH CENTRE	5	5
TOTAL	**205**	**171**

3.7 Data Collection Tools and Procedures

3.7.1 Study Questionnaire

A semi structured questionnaire (Appendix 1) developed by the researcher was used for collecting data. The questionnaire included questions on socio-demographic characteristics, nutrition training background, maternal nutrition knowledge, attitude towards maternal nutrition care, and maternal nutrition care practices of the nurses at the RH department, KNH.

3.7.1.1 Socio-demographic Characteristics

This section comprised of three questions that sought to establish the socio-demographic characteristics of the nurses. These included sex, age, and marital status (Appendix 1).

3.7.1.2 Nutrition Training Background

Questions on the nutrition training background sought to determine the highest level of education of the nurses; their professional qualification; the duration of work experience at the Reproductive Health department; whether maternal nutrition was covered during their professional nursing training programme; whether they had attended any continuous professional development forum that addressed maternal nutrition; the duration and frequency of such trainings; the last time they attended a continuous professional development session on nutrition; their main source of information and reference materials on maternal nutrition during the previous two years; where and how they sought for information and reference materials on maternal nutrition; and whether the reference materials and information sources were regularly updated (Appendix 1).

3.7.1.3 Practices

Questions on practices aimed at assessing the nurses actions related to maternal nutrition care in the course of discharging their professional duties. The questions presented the nurses with practical situations on maternal nutrition status assessment and diagnosis, and advising pregnant mothers on appropriate dietary practices. The questions were accompanied by multiple-choice responses with provision for the respondents to give their appropriate response where the statements provided did not include their opinion. Most practice questions were accompanied by three statements namely; 1) Yes - which implied that they always

carried out that practice; 2) No – meant that they did not do it at all; and 3) Sometimes – implied that they carried out the practice but not consistently. Each practice action that the nurses responded to as "No" was accompanied by an open-ended question for an explanation of the reason why they would not or did not carry out that practice (Appendix 1).

The statements on maternal nutrition care practices sought to find out what measurements the nurses would use to assess the nutritional status of a pregnant mother; whether they weighed mothers often on admission or clinic visit; the anthropometric assessment tools they used on women in their unit; whether they educated pregnant mothers in the ward/clinic on the importance of eating a healthy and well balanced diet; whether they encouraged pregnant mothers to take nutritional supplements containing IFAS during their pregnancy; whether they discussed the nutritional status and nutritional management of pregnant mothers with other team colleagues during ward rounds or clinic visits; the action they would take if they observed that a mother was not receiving adequate nutrition; and reasons that would motivate them to weigh patients.

3.7.1.4 Knowledge

This section comprised of 15 questions aimed at assessing the nurses' understanding on aspects of maternal nutrition during pregnancy. The questions assessed the nurses' knowledge on maternal nutritional practices during pregnancy, dietary requirements at different stages of pregnancy, recommended weight gain during pregnancy, unhealthy dietary practices during pregnancy, risk factors to maternal and foetal health during pregnancy, goals of a successful pregnancy, and physiological anaemia during pregnancy. The respondents selected what in their opinion, was the correct response to each of the 15 knowledge questions from a provision of four multiple-choice statements (Appendix 1).

3.7.1.5 Attitude

The statements expressing attitude assessed the nurses' perceptions on maternal nutrition and their role and responsibility in delivering nutritional care to pregnant mothers.

Attitude was assessed on a 4-point Likert scale (1=Strongly agree; 2=Agree; 3=Disagree; 4=Strongly disagree) to determine the degree of the nurses' agreement or disagreement to 10

questions pertaining to maternal nutrition management. The statements assessed the nurses' perceptions towards their responsibility in assessing the nutritional status of pregnant and lactating mothers at the clinics and wards; whether it was important to assess the nutritional status of all mothers admitted to the ward; whether all pregnant women and lactating mothers should be knowledgeable about the need for an adequate and nutritious diet; whether all women should be encouraged to take IFAS during pregnancy; whether all women should be counselled on adequate and healthy weight gain during pregnancy; whether all women at risk including adolescents, HIV-positive women, and women in emergency situations should receive special nutrition support; whether pre-pregnancy nutrition influences a woman's ability to conceive, determines foetal growth and development as well as the health of the mother; whether underweight and overweight women experience more complications during pregnancy and delivery than normal weight women; whether good maternal nutrition is important for a successful pregnancy, child delivery and lactation; and whether nutrition education is not the responsibility of the nurse. Respondents rated their level of agreement or disagreement to the statements by selecting the response that best expressed their feelings and thoughts about the issue in question. This section was concluded with an open-ended question on the nurses' perception on their role in the nutritional management and care of pregnant mothers (Appendix 1).

3.7.2 Key Informant Interviews

Key informant interviews (KII) were conducted to verify and provide more insights to the information that was collected in the questionnaires (Appendix 2). KII are useful in answering the "whys" of unexplained social phenomena (Scrimshaw and Hurtado, 1987). KII were conducted on five nurses in managerial positions; namely, the in-charges of wards and units that directly deal with pregnant mothers. The interviews were to determine the opinions of the nurses with regard to whether they had adequate knowledge and skills to provide maternal nutrition care to pregnant women and lactating mothers; whether nurses at KNH provided adequate and appropriate nutritional care to pregnant mothers in the wards and clinics; whether nurses at KNH had an adequate training background on maternal nutrition; whether there was a Continuous Professional Development programme for health workers including nurses at KNH that addressed maternal nutrition; the reference materials and sources of information on maternal nutrition that were available for use by nurses at KNH;

whether the sources of information and reference materials were regularly updated; whether nurses at KNH had an easy access to reference materials on maternal nutrition (Appendix 2).

3.7.3 Direct Observation

The observation method provides valuable non-verbal information to the actual situation and happenings and hence was regarded an important tool in assessing the actual behaviour and practices of the nurses on maternal nutrition care. An observation checklist was used to establish the actual maternal nutrition care practices of nurses at the wards and units that provide antenatal care to pregnant women, namely; Clinic 18, Ward 1A, GFA, and GFB for 5 working days of the week. The maternal nutrition care practices assessed included weight measurement of pregnant women; nutrition assessment tools available and in use at the clinic or ward; education of pregnant women on the importance of healthy and nutritious; prescription for Iron and Folate supplements; guidelines and resource materials available on maternal nutrition (Appendix 3).

3.8 Ethical and Human Rights Consideration

The research proposal was approved by the University of Nairobi and Kenyatta National Hospital Ethics and Research Committee (UON-KNH ERC) research reference number P618/09/2015 (Appendix 9) before commencement of the study. Clearance and authority to carry out the study in KNH was also sought through the Research and Programs department. Each respondent was explained about the study and informed consent obtained (Appendix 4). The consent form included an invitation to participate in the study, an explanation of the title, objectives, aim, purpose, expected benefits, risks, voluntarism and confidentiality in handling all information throughout the research process. The data collection tools (Appendix 1, 2, 3) were pre-coded according to the ward or unit and the number of nurses participating respectively to ensure anonymity of the respondents. Information provided to the researcher will be used for this study and not shared for any other purposes or projects. The principal researcher availed her contacts including that of the UON-KNH ERC to the respondents for any clarification or concern that was to be addressed during the study.

3.9 Recruitment and Training of Research Assistants

Through an interview process, the study recruited two research assistants with at least a diploma in nutrition and dietetics and previous experience in data collection. The research assistants assisted the researcher to administer the questionnaires and carry out direct observation. The principal investigator trained the research assistants for two days. The training programme (Appendix 5) included; introduction and objectives of the study; overview of the content and comprehension of each item on the questionnaire, key informant interview guide, and observation guide; interviewing skills; research ethics and conduct; pre-test of the data collection tools including a practical demonstration (role play) on recruiting study participants, administration of the questionnaires, tracking, and checking for completeness was also done to enhance understanding and mastery of the exercise and process. The training concluded with the preparation of a work plan for carrying out the study.

3.10 Pre Test of the Data Collection Tools

The questionnaire was pretested at Mbagathi Level 5 Hospital on 20 nurses working at the Reproductive Health department to check whether the questions were clear, well structured, specific, and aligned to the study objectives. Ten percent of the study sample size (205) formed the sub sample size (20) for pre-testing the questionnaire while 2 nurse ward managers formed the sample for the key informant interviews. The observation guide was tested at the ante-natal clinic and ante-natal ward.

The subjects were purposively selected using the inclusion and exclusion criteria described in section 3.4 and 3.5 respectively. The study was explained to the respondents and informed consent obtained. Each respondent completed the questionnaire and independently provided written comments on the existing questions where necessary. The principle researcher worked along with the research assistants for supervision and quality checks. At the end of the pre-test, a debriefing session for the research team was held to share the challenges encountered during data collection and how they would be addressed. All questionnaires were screened for completeness and proposed suggestions incorporated to improve the content and comprehension of the tools. This was the basis of validating the data collection tools for this study.

3.11 Data Collection, Cleaning and Entry Procedure

Data was collected between 25th January and 4th March 2016. A list of all nurses working at the Reproductive Health department was obtained from the Senior Assistant Chief Nurse in charge. The study objectives, purpose, expected benefits and procedure was explained to the nurses before consent was obtained and questionnaire issued. The study questionnaire (Appendix 1) together with a consent form (Appendix 4) was issued to the respondents who accepted to participate in the study. Most respondents preferred to complete the questionnaires on their own. Each questionnaire distributed was coded according to the RH unit and the respondent number (i.e Ward 1A_01, 1A_02, etc). The principal researcher availed her physical, email, and phone contacts to the respondents and obtained the same from them where acceptable for tracking of the questionnaires. The research team made follow up calls to track the questionnaires for respondents who opted to complete them on their own. The researcher closely supervised the research assistants during data collection to ensure quality. All questionnaires were verified for completeness by the principal researcher then coded and entered into an excel sheet before analysis. Data was cleaned by use of frequencies to identify missing values, outliers, invalid entries and appropriate amendments undertaken before analysis.

Key informant interviews (Appendix 2) and direct observations using a checklist (Appendix 3) were conducted to provide further insights into the study by establishing the actual maternal nutrition care practices of the nurses.

3.12 Quality Assurance Procedures

All research instruments were pretested to ensure they addressed the specific objectives of the study. The research assistants were trained and closely supervised on how to correctly administer the data collection instruments to enhance the validity of the data collected. The questionnaires were screened for completeness and legibility before accepting them back from the respondents. All data was cleaned using frequencies and missing values and invalid entries were counter-checked with the responses on the questionnaires for accuracy and where necessary the respondents contacted for clarification.

3.13 Data Analysis

The correct responses to the 15 knowledge questions (Appendix 1) were as presented in Table 2 below:

Table 2: Maternal Nutrition Knowledge Attributes

Maternal nutrition knowledge attributes
1. A maternal practice that can be harmful to the foetus is a low carbohydrate diet
2. To produce a healthy infant, a mother should ideally have an adequate diet beginning months before conception occurs and continuing through the period of lactation
3. The third trimester is the main time for storage of iron, fat, and calcium
4. Infants born after normal gestation length but weighing less than 2.5Kg are labelled small for gestational age
5. A pregnant woman needs to increase her energy intake by about 300Kcals/day during the last two trimesters of pregnancy
6. An energy source to avoid in pregnancy and lactation is alcohol
7. An increased requirement for folate and Vitamin B-12 during pregnancy is related to their roles in the synthesis of red blood cells
8. Weight gain in pregnancy for healthy women should usually be at least 12 to 15 Kg
9. The practice of eating dirt, clay, or laundry starch during pregnancy is called pica
10. Maternal age of 30 – 35 years is not likely to pose a risk to maternal and foetal health during pregnancy and childbirth
11. The risk of delivering a premature or small for gestational age infant increases with maternal smoking, alcohol consumption, and illegal or improper drug use
12. The desirable goal for a successful pregnancy is gestational period longer than 37 weeks and birth weight greater than 2500 grams
13. To avoid constipation, the pregnant woman should increase her intake of whole-grain cereals, vegetables, and fruits
14. Physiological anaemia of pregnancy results from an increase in the mother's blood volume
15. Iron and Folic Acid Supplements should be taken by pregnant women from conception to delivery

A score of 1 point was awarded for every correct answer and 0 for incorrect answers to each of the 15 questions (Table 2). The maximum and minimum knowledge scores possible was 15 and 0 respectively. A grading system was established to further categorize the knowledge scores as poor ($\leq$ 7), moderate (8 - 10) and good (11 - 15). Using the median score of 8 as a cut-off point, the three categories were subsequently grouped into two to show adequate

knowledge (8 - 15) and inadequate knowledge (< 8) (Khan et al., 2014). The range, frequencies, percentages, arithmetic means, median, and mode were computed.

The 10 statements on attitude towards maternal nutrition care (Appendix 1) with responses based on a 4-point Likert scale, were scored as (strongly disagree=4 points, disagree=3 points, agree=2 points, strongly agree=1 point). The cumulative score ranged between 10 and 40 points for the ten statements. Using the median score as the cut-off point, two categories were derived. Lower points below the median (< 25 points) indicated a negative attitude while points above the median (≥ 25points) implied a positive attitude. Content analysis was done on information obtained from the open-ended question in this section. Frequencies, percentages, and arithmetic means of the responses were also computed.

There were thirteen questions on maternal nutrition care practices (Appendix 1), five of which had three response options indicating the consistency of the practice and was scored as (1=yes/sometimes, 0=no practice). Content analysis was done for the 5 open ended questions following responses that indicated no practice, and was presented as qualitative data. The other 3 questions with multiple responses were analysed using frequencies and percentages. Responses that indicated the correct practice i.e. (yes, sometimes and the correct choice of the appropriate practice) were regarded as the recommended practice and given a score of 1 while (no, none, never or the wrong choice of the recommended practice), implied inappropriate practice and given a score of "0" (Table 3). The maximum attainable score for recommended maternal nutrition care practices was 7 while the least was 0. A cumulative score of (>4) implied appropriate practice while (<4) inappropriate practice.

Table 3: Maternal Nutrition Care Practice Attributes

	Maternal Nutrition Care Practice Attributes	Recommended Practice
1.	Measurements to assess nutritional status of pregnant mothers	-Weight gain, Mid Upper Arm Circumference, diet history
2.	Weigh mothers often on admission or clinic visit	Yes Sometimes
3.	Educate pregnant mothers in the ward/clinic on the importance of eating a healthy and well balanced diet	Yes Sometimes
4.	Encourage pregnant mothers to take nutritional supplements containing iron and folate daily during their duration of pregnancy	Yes Sometimes
5.	Discuss the nutritional status and nutritional management of pregnant mothers with other team colleagues during ward rounds or clinic visits	Yes Sometimes
6.	Action taken for a patient not receiving adequate nutrition	-Consult the nutritionist -Discuss with the patient possible diet options
7.	Reasons for weighing patients	-Obvious weight loss, poor appetite, and reduced food intake

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 22. Normality of data was tested using frequency distributions (histogram). Both descriptive and inferential statistics involving Pearson's Chi-square test, Independent t-tests, Analysis of Variance, Odds Ratio, Mann-Whitney U test, Kruskal Wallis H test, and multiple linear regression were used to present results. For each test, a confidence level of 95 percent and statistical significance of less than 0.05 was used. Content analysis was done for qualitative data obtained from key informant interviews and direct observation highlighting major themes, similarities and differences.

3.14 Study Limitations

The study was conducted on nurses working at the Reproductive Health department, Kenyatta National Hospital. The results of this study thus cannot be used to depict the overall maternal nutrition knowledge, attitude and practices of nurses in Kenya, since the sample is

not representative of all the nurses in Kenya. Hence, interpretation of results should be done with caution.

Data was collected using a self-reporting method. This could yield incorrect or dishonest responses especially relating to attitude and practices as respondents would fear being depicted as having a negative attitude or inappropriate practices in their work despite the assurance and guarantee of personal anonymity.

CHAPTER 4: RESULTS

4.1 Response Rate

The response rate for the study was 83.4% representing a total recruitment and completion of study questionnaires by 171 out of the 205 nurses at the Reproductive Health department, KNH. A response rate of over 70% was excellent and adequate for analysis and reporting (Mugenda and Mugenda, 2003). Of the 205 nurses working at the Reproductive Health department, 34 did not meet the inclusion criteria as 13 declined to participate, 5 had been worked in the unit for less than 3 months prior to the study, and 16 were on annual/maternity/study/sick leave. Some of the reasons given by those who declined to participate included lack of time due to very busy work schedules, that the study was more appropriate for nutritionists, and that there were no incentives for participation in the study.

4.2 Socio-demographic Characteristics of the Respondents

Table 4 shows the socio-demographic characteristics of the respondents who participated in the present study. Majority (77.8%) of the respondents were females (**p=0.000**) with a male to female ratio of approximately 1:5. Their mean age was 39.5±10 years with a median and mode of 40years respectively and a range of 21 to 60 years. The mean age of the female respondents was significantly higher (40.56±10.31 years) than that of the males (35.82±8.60 years) (p=**0.010**). Three quarters (74.9%) of the respondents were married

Table 4: Socio-demographic Characteristics of the Respondents

Characteristic	Frequency (n)	Per cent (%)	(N=171)
Sex			
Male	38	22.2	
Female	133	77.8	
Marital status			
Married	128	74.9	
Unmarried	43	25.9	

4.3 Nutrition Training Background of the Respondents

Table 5 shows the academic qualifications of the respondents. More than two thirds (71.3%) of the nurses were diploma holders while nearly one-quarter (23.4%) had at least a bachelors degree.

Table 5: Academic Qualifications of the Respondents

Characteristic	Frequency (n)	Per cent (%)	(N=171)
Certificate	9	5.3	
Diploma	122	71.3	
Bachelors Degree	37	21.6	
Masters Degree	3	1.8	

Figure 1 shows the number of years of nursing experience within the RH department. More than a third (35.1%) of the respondents had an experience of 5-9 years with approximately 1 in 3 having an experience of less than 5 years. A fifth of them (21.2%) had a nursing experience of more than 10 years within the Reproductive Health department.

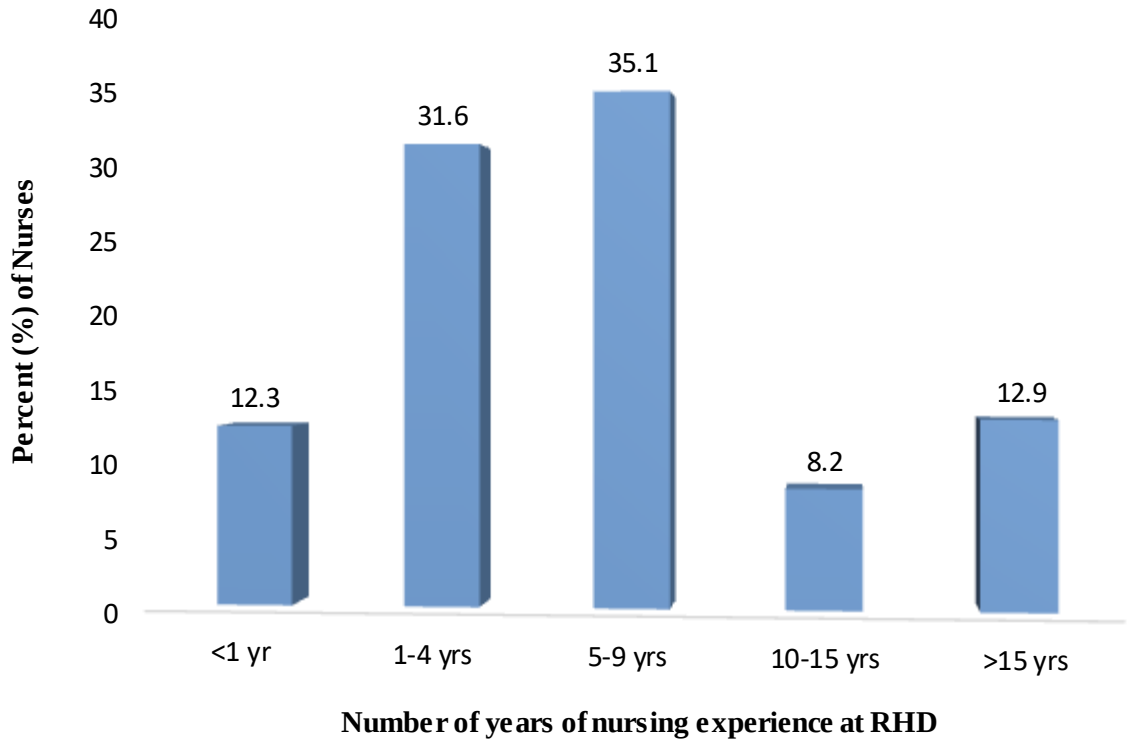

Figure 1: Nursing Experience at the Reproductive Health Department

There was no significant association between nursing experience and academic qualifications of the respondents (p=0.172) as shown in Table 6.

Table 6: Association between Nursing Experience and Academic Qualifications

	Academic qualification (N=171)				
Nursing Experience at RHD (years)	**Certificate**	**Diploma**	**Bachelors degree**	**Masters degree**	**Test Statistic**
< 1	0	13	8	0	
1-4	0	44	9	1	χ^2=16.427,
5-9	5	40	14	1	12df,
10-15	1	9	3	1	p=0.172
>15	3	16	3	0	

Most (89%) of the respondents reported that the topic on maternal nutrition was covered in their nursing course. However, there was no significant association with academic qualifications (p=0.829) as shown in Table 7.

Table 7: Association between Academic Qualifications and Topic on Maternal Nutrition

	Covered topic on maternal nutrition (N=171)		
Factor/characteristic	**Yes**	**No**	**Test statistic**
Academic qualification			
Certificate	8	1	χ^2=0.886, 3df,
Diploma	107	15	p=0.829
Bsc. degree	34	3	
Msc degree	3	0	

More than three quarters (77.2%) of the respondents reported to have attended a short professional course on maternal nutrition while (22.8%) had not. Nursing experience at the RH department was significantly associated with having attended a short professional course on maternal nutrition (**p=0.000**) as shown in Table 8. Respondents with longer working experience within the Reproductive health department were more likely to have attended a short professional course on maternal nutrition. More than 90% or respondents with nursing experience of 10 years and above had attended a short professional course on maternal

nutrition compared to 63% of those who had worked at the RHD for less than 5 years (**p=0.000**) as illustrated in Table 8.

Table 8: Association between Academic Qualification, Nursing Experience and Attending a Short Professional Course on Maternal Nutrition

	Attendance to a short professional course (N=171)		
Factor/characteristic	**Yes**	**No**	**Test statistic**
Academic qualification			
Certificate	9	0	χ^2=3.098, 3df,
Diploma	92	30	p=0.377
Bsc. degree	29	8	
Msc degree	2	1	
Nursing experience (years)			
<1	14	7	χ^2=21.715, 4df,
1-4	32	22	**p=0.000**
5-9	51	9	
10-15	13	1	
>15	22	0	

The average length of the short professional course on maternal nutrition was 10.08±5.96 days with median and mode of 7.5 days and 14 days respectively and a range of 1 to 30 days. There was a significant association with academic qualification **(p=0.000)** and not nursing experience (p=0.273) as shown in Table 9 and Table 10 respectively.

Table 9: Association between Academic Qualification and Length of Short Professional Course on Maternal Nutrition

	Length of nutrition training in days (N=171)					
Factor/characteristic	**1-5**	**6-10**	**11-15**	**16-20**	**21-30**	**Test Statistic**
Academic qualification						
Certificate	3	2	3	0	1	χ^2=37.038, 12df,
Diploma	21	28	36	1	6	**p=0.000**
Bsc. Degree	8	12	7	0	2	
Msc. degree	1	0	0	1	0	

Table 10: Association between Nursing Experience and Length of Short Professional Course on Maternal Nutrition

	Length of nutrition training in days (N=171)					
Factor/characteristic	**1-5**	**6-10**	**11-15**	**16-20**	**21-30**	**Test Statistic**
Nursing experience (years)						
<1	6	5	1	0	2	χ^2=18.920, 16df,
1-4	10	9	9	1	3	p=0.273
5-9	9	18	21	1	2	
10-15	6	2	5	0	0	
>15	2	8	10	0	2	

Table 11 shows the responses on the frequency of short professional trainings on maternal nutrition. Over half (52.6%) of the respondents did not know how regularly the short professional courses on maternal nutrition were offered (**p=0.000**). About a quarter (24.6%) reported that the trainings were offered on an annual basis. A few (2.9%) said that the trainings were never held. Only 10(5.8%) respondents answered the question correctly that short professional trainings on maternal nutrition at KNH are held bi-annually.

Table 11: Regularity of Short Professional Trainings on Maternal Nutrition

Regularity	**Frequency (N=171)**	**Percent (%)**
Quarterly	20	11.7
Bi-annually	10	5.8
Annually	42	24.6
Once every 3years	4	2.3
Never	5	2.9
Do not know	90	52.6

There was a significant association between the knowledge of the respondents on the regularity of the short professional trainings on maternal nutrition and having attended a short professional course on maternal nutrition (**p=0.000**) as shown in Table 12. About 43% of the respondents who had attended a short professional course on maternal nutrition did not know the frequency of the trainings compared to (87.2%) of those who had not (Table 12).

Table 12: Association between Academic Qualification, Attendance of a Short Professional Course and Regularity of Trainings on Maternal Nutrition

	Knowledge of regularity of trainings (N=171)						
Factor/ Characteristic	**Quarterly**	**Bi-annually**	**Annually**	**Once in 3 yrs**	**Never**	**Don't know**	**Test Statistic**
Academic qualification							
Certificate	2	1	2	1	0	3	χ^2=16.766
Diploma	12	5	34	1	4	66	15df
Bsc. Degree	6	3	6	2	1	19	p=0.333
Msc. Degree	0	1	0	0	0	2	
Attendance of short professional course							
Yes	20	9	42	4	1	56	χ^2=41.179
No	0	1	0	0	4	34	5df
							p=0.000

When asked about the duration since they last attended a training session on nutrition, the responses were as illustrated in Figure 2. More than a third (37.4%) of the respondents had attended a training on nutrition less than two years prior to the study while slightly over one quarter (26.3%) stated that they had not attended such trainings at all.

Nursing experience and attendance of a short professional course on maternal nutrition were significantly associated with the duration since they had last attended a training on nutrition (**p<0.05**) as shown in Table 13.

Majority (82.1%) of the respondents who reported that they had not attended a short professional course on maternal nutrition had also not attended a nutrition training compared to (9.8%) who had (**p=0.000**) (Table 13).

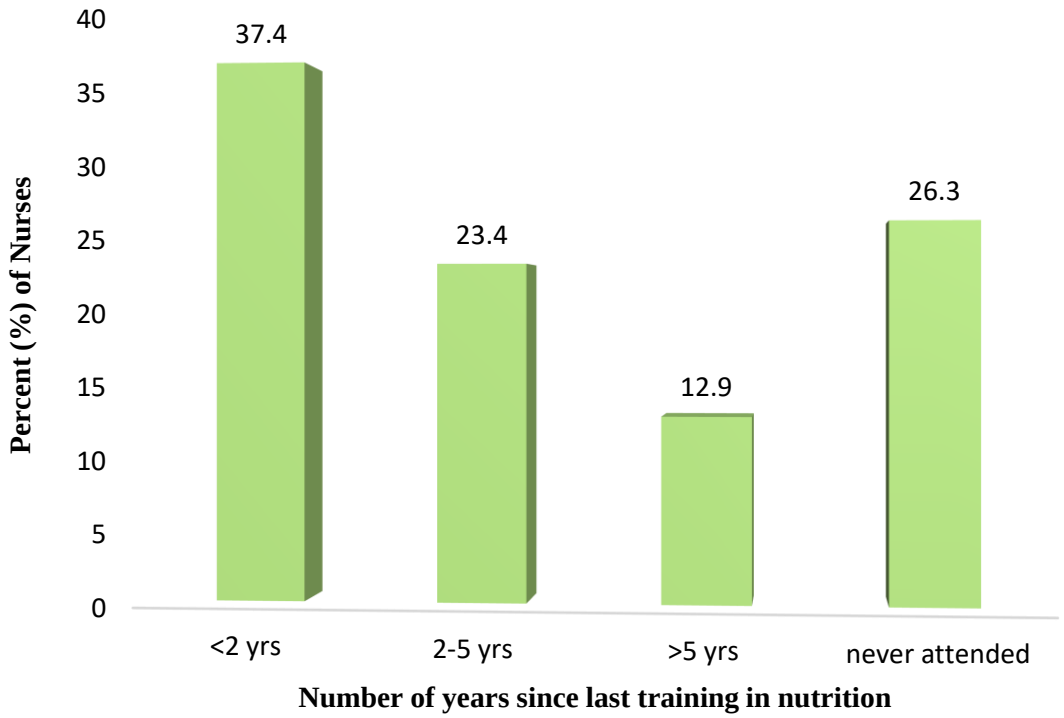

Figure 2: Duration Since Last Attended a Training Session on Nutrition

Table 13: Association between Nursing Experience, Attendance of a Short Professional Course and Duration since Last Training on Nutrition

	Duration since Last Training on Nutrition in Years (N=171)				
Factor/characteristic	**<2**	**2-5**	**>5**	**Never attended**	**Test Statistic**
Nursing experience (years)					
<1	8	2	1	10	χ^2=32.646, 12df,
1-4	20	11	3	20	**p=0.001**
5-9	23	16	8	13	
10-15	7	1	5	1	
>15	6	10	5	1	
Attendance to short professional course					
Yes	61	38	20	13	χ^2=81.130, 3df,
No	3	2	2	32	**p=0.000**

The main source of information and reference materials on maternal nutrition reported by the respondents is shown in Figure 3. Nearly one-quarter (23.4%) of the nurses stated that they obtained information on maternal nutrition mainly from Maternal Infant and Young Child Nutrition (MIYCN) National Policy Guidelines with a statistical difference (**p=0.000**). Other important sources of maternal nutrition information included professional experience (19.3%), internet (16.4%), training workshops and seminars (13.4%) among others as illustrated in Figure 3.

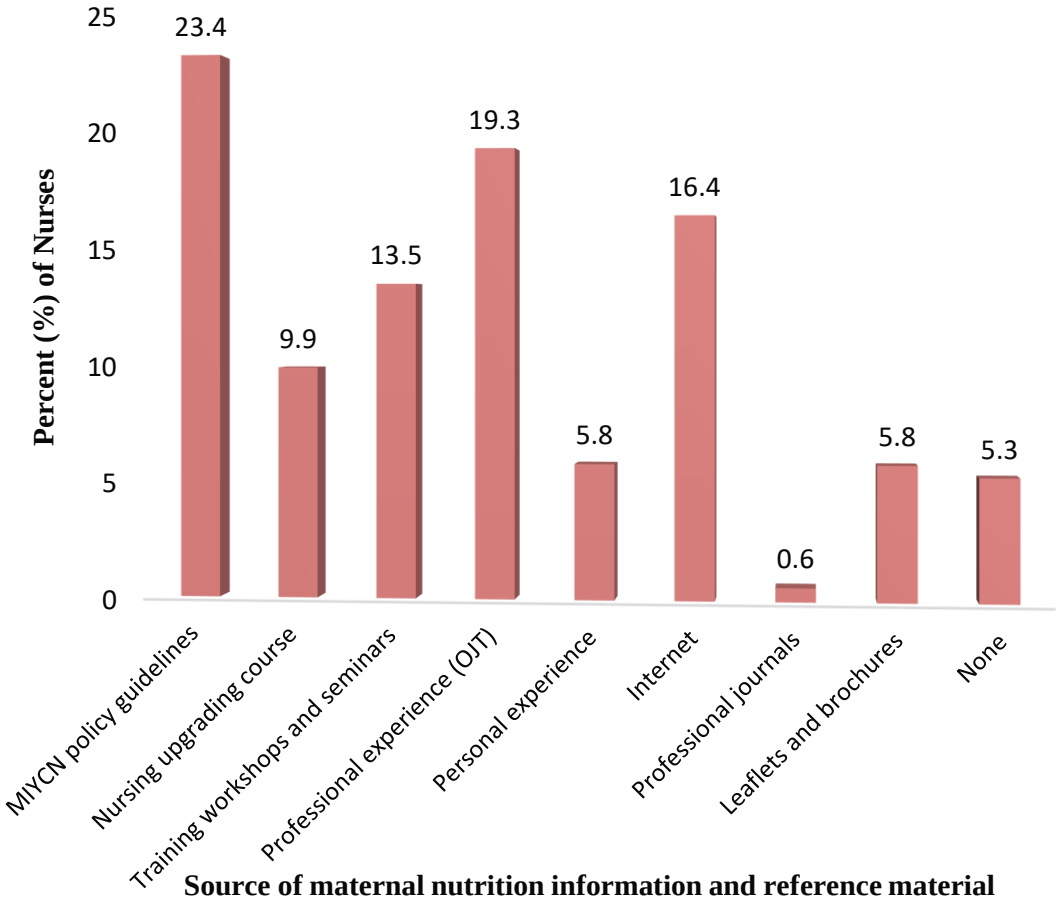

Figure 3: Main source of maternal nutrition information

Respondents who had attended a short professional course on maternal nutrition mostly used MIYCN guidelines ((27.3%), information from training workshops and seminars (17.4%) and the internet (17.4%) while those who had not attended relied on professional experience

(35.9%), personal experience (12.8%) and the internet (12.8%) with a significant difference (**p=0.000**).

Majority (84.8%) of the respondents indicated that they knew where and how to obtain maternal nutrition information from the various sources as compared to only a few (15.2%) who did not.

Table 14 shows the associations between knowledge on where and how to find maternal nutrition information and sex, age, nursing experience, academic qualification and main source of such information. There were no significant associations between the factors (p>0.05).

Table 14: Associations between Knowledge on Where and How to Obtain Maternal Nutrition Information and Nutrition Training Background Factors

Knowledge on where to obtain nutrition information (N=171)			
Factor/characteristic	**Yes**	**No**	**Test Statistic**
Academic qualification			
Certificate	8	1	χ^2=4.394, 3df
Diploma	100	22	p=0.222
Bsc. Degree	35	2	
Msc. Degree	2	1	
Nursing experience (years)			
<1	17	4	χ^2=6.140, 4df
1-4	41	13	p=0.189
5-9	54	6	
10-15	13	1	
>15	20	2	
Main source of maternal nutrition information			
MIYCN guidelines	36	4	χ^2=13.355, 8df,
Nursing upgrading course	16	1	p=0.100
Training w/shops	19	4	
Professional experience	26	7	
Personal experience	8	2	
Internet	27	1	
Professional journals	1	0	
Leaflets & brochures	6	4	
None	6	3	

About a half (52.6%) of the respondents reported that their main sources of information and reference materials on maternal nutrition were regularly updated. There was a significant association between regular update of references on maternal nutrition with main source of maternal nutrition information and where and how to find maternal nutrition information (**p<0.05**) as shown in Table 15.

The respondents who stated that their main source of maternal nutrition information and references used was regularly updated mostly used MIYCN guidelines (30%), Internet (18.9%), and workshops and seminars (14.4%) while those who indicated that they were not updated relied on professional experience (27.5%), workshops and seminars (20%), and personal experience (10%). The respondents who did not know whether information and reference sources were regularly used MIYCN guidelines (12.1%), information taught in the nursing upgrading course (9.8%) while (12.1%) did not use any source at all with a significant difference (**p=0.029**) as illustrated in Table 15.

Most (60.7%) of the respondents who stated that they knew where and how to find information and reference sources on maternal nutrition also indicated that they were regularly updated while (17.9%) did not know. A third (34.6%) of those who did not know where and how to find the reference sources said that they were not regularly updated while (7.7%) reported that they were updated with a significant difference (**p=0.000**) (Table 15).

Table 15: Associations between Regular Update of Maternal Nutrition Reference Sources and other Factors

Regular Update of Maternal Nutrition References (N=171)		
Factor/characteristic	**Test Statistic**	**p value**
Academic qualification	χ^2=9.239, 6df	0.113
Nursing experience	χ^2=12.460, 8df	0.120
Main source of maternal nutrition information	χ^2=26.202, 16df	**0.029**
Knowledge of where and how to find maternal nutrition information	χ^2=29.308, 2df	**0.000**

The informants acknowledged that KNH provides training programmes on maternal nutrition for health workers that include the Lactation Management course, Infant and Young Child Feeding Course, and PMTCT training. With regard to the reference materials and sources of information on maternal nutrition available for use by nurses, the informants reported that nurses accessed them mainly through the internet by use of computers in the ward or personal smart phones and interaction with nutrition colleagues. Some used information sources available at the library and Lactation Management Centre though the reference materials were rarely updated they noted. Policy guidelines were displayed on the notice boards in some wards and ANC enabling easy access. However, they said that some of the information sources were obsolete especially the posters while national guidelines were updated as appropriate when new evidence was available.

4.4 Knowledge of the Respondents on Maternal Nutrition

Table 16 presents the mean knowledge scores of the male and female respondents. The minimum score was 3 and the highest 14 on the 15 knowledge questions. The average knowledge score of the respondents on maternal nutrition was 9.46±2.26 with the mode and median score of 10 respectively.

As shown in Table 16, there was no significant difference between the mean maternal nutrition knowledge scores of male and female respondents (p=0.353).

Table 16: Mean Maternal Nutrition Knowledge Scores of Male and Female Respondents

	Sex	(N=171)	Mean	SD	Test Statistic	p Value
Knowledge Score	Male	38	9.76	2.11	t=0.932,	p=0.353
	Female	133	9.38	2.30	169df,	

Table 17 presents the correct and incorrect responses to the 15 knowledge questions on maternal nutrition. The results showed that the respondents had low knowledge levels in the following areas: recommended weight gain during pregnancy (28%), definition of Small for Gestational Age (SGA) (33%), prime time for storage of iron, fat, and calcium (36%), meaning of physiological anaemia during pregnancy (40%), and the recommended energy increment per day during the last two trimesters of pregnancy (45%) as shown in table 16.

The respondents demonstrated high knowledge levels in the following areas: the desirable goal for a successful pregnancy (95%), definition pica (90%), type of energy source to be avoided during pregnancy and lactation (89%), factors that increase the risk of delivering a premature or small for gestational age infant (85%) and factors likely to pose a risk to maternal and foetal health during pregnancy and childbirth (72%).

Table 17: Responses to the Maternal Nutrition Knowledge Questions

Maternal Nutrition Knowledge (N=171)	Correct n (%)	Incorrect n (%)
1. A maternal practice that can be harmful to the foetus is a low carbohydrate diet, fasting and smoking	**103 (60.2)**	**68 (39.8)**
2. To produce a healthy infant, a mother should ideally have an adequate diet	**111 (64.9)**	**60 (35.1)**
3. The third trimester is the main time for storage of iron, fat, and calcium	**61 (35.7)**	**110 (64.3)**
4. Infants born after normal gestation length but weighing less than 2.5Kg are labelled small for gestational age	**56 (32.7)**	**115 (67.3)**
5. A pregnant woman needs to increase her energy intake by about 300Kcals/day during the last two trimesters of pregnancy	**77 (45)**	**94 (55)**
6. An energy source to avoid in pregnancy and lactation is alcohol	**152 (88.9)**	**19 (11.1)**
7. An increased requirement for folate and Vitamin B-12 during pregnancy is related to their roles in the synthesis of red blood cells	**122 (71.3)**	**49 (28.7)**
8. Weight gain in pregnancy for healthy women should usually be at least 12 to 15 Kg	**48 (28.1)**	**123 (71.9)**
9. The practice of eating dirt, clay, or laundry starch during pregnancy is called pica	**153 (89.5)**	**18 (10.5)**
10. Maternal age of 30 – 35 years is not likely to pose a risk to maternal and foetal health during pregnancy and childbirth	**123 (71.9)**	**48 (28.1)**
11. The risk of delivering a premature or small for gestational age infant increases with maternal smoking, alcohol consumption, and illegal or improper drug use.	**146 (85.4)**	**25 (14.6)**
12. The desirable goal for a successful pregnancy is gestational period longer than 37 weeks and birth weight greater than 2500 grams.	**92 (53.8)**	**79 (46.2)**
13. To avoid constipation, the pregnant woman should increase her intake of whole-grain cereals, vegetables, and fruits.	**163 (95.3)**	**8 (4.7)**
14. Physiological anaemia of pregnancy results from an increase in the mother's blood volume.	**68 (39.8)**	**103 (60.2)**
15. Iron and Folic Acid Supplements (IFAS) should be taken by pregnant women from conception to delivery	**110 (64.3)**	**61 (35.7)**

Figure 4 shows the level of knowledge on maternal nutrition of the respondents. Approximately 1 in 5 respondents (19.9%) had poor knowledge (Score 0-7) with slightly less than half of them (45%) having moderate maternal nutrition knowledge (Score 8-10). Slightly over one third (35.1%) had good maternal nutrition knowledge (Score 11-15). Overall, 4 in 5 nurses (80.1%) had adequate maternal nutrition knowledge (Score 8-15).

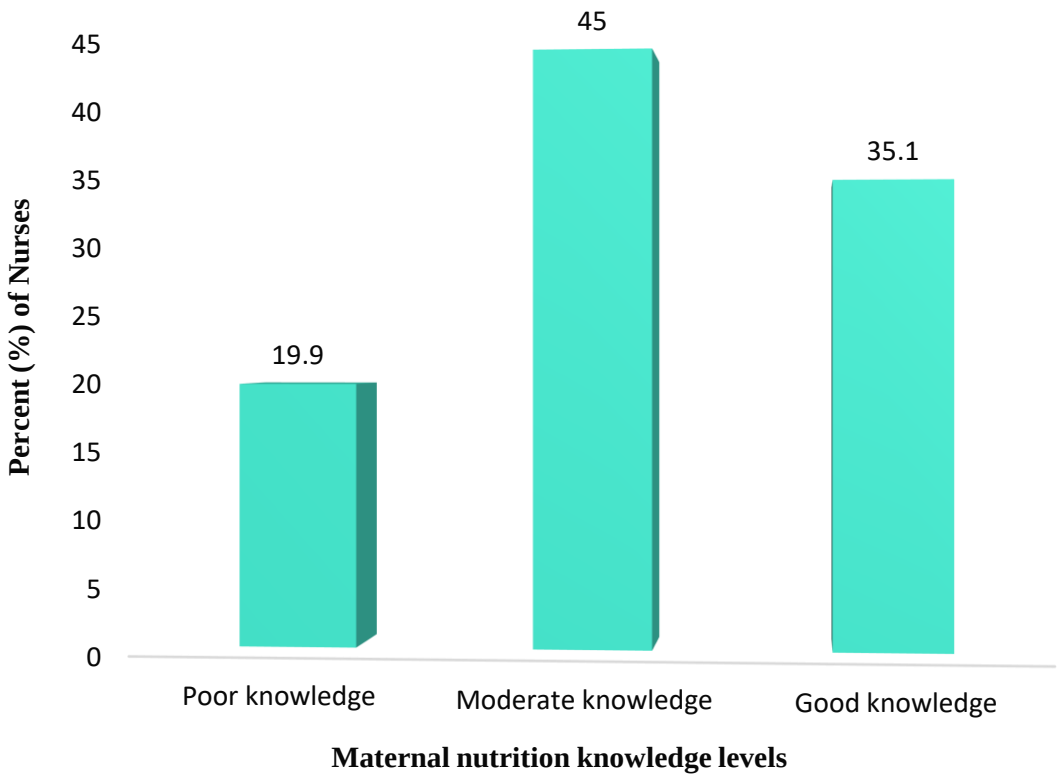

Figure 4: The Respondents Level of Knowledge on Maternal Nutrition

Table 18 and 19 show the relationships between the nutrition training background characteristics and adequate and inadequate maternal nutrition knowledge. The length of short professional course on maternal nutrition showed a significant association (**p=0.001**) with maternal nutrition knowledge (Table 18). Majority (89.2%) of the respondents who reported to have attended a short professional course on maternal nutrition lasting 1–10 days had adequate knowledge (score ≥8) compared with (60%) of those who attended short courses lasting 11-30 days with a significant difference (**p=0.001**) as shown in Table 18.

Table 18: Relationship between Maternal Nutrition Knowledge and Nutrition Training Background Factors

	Maternal Nutrition Knowledge			
Characteristic/factor	**N=171**	**Inadequate n(%)**	**Adequate n(%)**	**Test Statistic**
Academic qualification				
Certificate	9	3 (33.3)	6 (66.7)	χ^2=2.334 3df,
Diploma	122	25 (20.5)	97 (79.5)	p=0.506
Bachelors Degree	37	5 (13.5)	32 (86.5)	
Masters Degree	3	1 (33.3)	2 (66.7)	
Nursing experience (years)				
<1 year	21	3 (14.3)	18 (85.7)	χ^2=4.613, 4df,
1-4	54	13 (24.1)	41 (75.9)	p=0.329
5-9	60	8 (13.3)	52 (86.7)	
10-15	14	3 (21.4)	11 (78.6)	
>15	22	7 (31.8)	15 (68.2)	
Covered maternal nutrition topic				
Yes	152	33 (21.7)	119 (78.3)	χ^2=2.868, 1df
No	19	1 (5.3)	18 (94.7)	p=0.090
Attended short course on maternal nutrition				
Yes	132	29 (22.0)	103 (78.0)	χ^2=1.582, 1df
No	39	5 (12.8)	34 (87.2)	p=0.208
Length of short nutrition training (days)				
1-5	33	4 (12.1)	29 (87.9)	χ^2=18.990, 4df
6-10	42	4 (9.5)	38 (90.5)	p=**0.001**
11-15	46	14 (30.4)	32 (69.6)	
16-20	2	1 (50.0)	1 (50.0)	
21-30	9	6 (66.7)	3 (33.3)	

When asked about the role KNH played in helping nurses to provide maternal nutrition care, the key informants mentioned that in-service training courses are conducted annually on maternal nutrition such as the Lactation Management course which was revised to the current WHO Maternal Infant and Young Child Feeding Course. However, they felt that the course should be offered more regularly. They noted that the hospital encourages and in certain cases supports staff to attend continuous professional development programmes within the

hospital and outside. They said that KNH also provides an environment for multidisciplinary management of patients and interaction among professionals.

Table 19: Relationship between Maternal Nutrition Knowledge and Nutrition Training Background Factors

	Maternal Nutrition Knowledge			
Characteristic/factor	**N=171**	**Inadequate n(%)**	**Adequate n(%)**	**Test Statistic**
Regularity of nutrition trainings				
Quarterly	20	5 (25.)	15 (75.0)	χ^2=0.992, 5df,
Bi-annually	10	1 (10.0)	9 (90.0)	p=0.911
Once in 3 years	4	1 (25.0)	3 (75.0)	
Never	5	1 (20.0)	4 (80.0)	
Do not know	90	18 (20.0)	72 (80.0)	
Duration since last nutrition training (years)				
<2	64	19 (29.7)	45 (70.3)	χ^2=6.825, 3df,
2-5	40	7 (17.5)	33 (82.5)	p=0.078
>5	22	2 (9.1)	20 (90.9)	
Never attended	45	6 (13.3)	39 (86.7)	
Main source of nutrition information				
MIYCN guidelines	40	11 (27.5)	29 (72.5)	χ^2=14.751, 8df,
Nursing upgrading course	17	2 (11.8)	15 (88.2)	p=0.064
Workshops/Training/seminars	23	3 (13.0)	20 (87.0)	
Professional experience	33	3 (9.1)	30 (90.9)	
Personal experience	10	5 (50.0)	5 (50.0)	
Internet	28	8 (28.6)	20 (71.4)	
Professional journals	1	0 (0.0)	1 (100.0)	
Leaflets & brochures	10	2 (20.0)	8 (80.0)	
None	9	0 (0.0)	9 (100.0)	
Knowledge on where & how to get information				
Yes	145	27 (18.6)	118 (81.4)	χ^2=0.954, 1df
No	26	7 (26.9)	19 (73.1)	p=0.329
Knowledge on regular update of main source of information				
Yes	90	20 (22.2)	70 (77.8)	χ^2=1.019, 2df
No	40	8 (20.0)	32 (80.0)	p=0.601
Don’t know	41	6 (14.6)	35 (85.4)	

The mean knowledge scores of some characteristics under nutrition training background were compared to establish whether there were any significant differences (Table 20).

The mean knowledge scores based on the length of short nutrition training course showed significant differences. Respondents who indicated that the length of the short professional course on maternal nutrition lasted 1-10 days had higher mean knowledge scores (9.92) compared with those who indicated longer duration (8.36) with a significant difference (**p=0.013**) as shown in Table 20. Respondents who said that they did not use any maternal nutrition information or reference materials, and those who used knowledge acquired through professional experience, or professional journals had higher mean scores compared with those who used other sources but there was no significant differences in their knowledge scores (p=0.085) as shown in Table 20.

There were no significant differences in mean knowledge scores based on academic qualification (p=0.095), main source of nutrition information (p=0.085) as well as attended a short professional nutrition course (p=0.749) as shown in Table 20.

The key informants' opinion on the adequacy of the knowledge and skills of nurses to provide maternal nutrition care to pregnant women was that nurses had only basic nutrition knowledge acquired during nursing training and/or continuous professional development forums. However, the level of knowledge and skills may vary they noted. Some nurses may have good basic knowledge while others may have outdated information. "Generally, nurses lack appropriate skills on maternal nutrition care" noted one informant. Nevertheless, the nutritionist is the expert in that area and hence should provide guidance on such matters they said.

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Table 20: Mean Knowledge Scores and Nutrition Training Background Factors

Characteristic/Factor	N=171	Mean(SD)	Mean Ranks	Test Statistic
Academic qualification				
Certificate	9	8.56±2.13	66.11	Kruskal-Wallis Test=6.375, 3df p=0.095
Diploma	122	9.31±2.20	82.35	
Undergraduate degree	37	10.08±2.24	100.72	
Masters degree	3	10.67±4.16	112.50	
Attended short nutrition course				
Yes	132	9.43±2.28	-	t=-0.32, 169df P=0.749
No	39	9.56±2.21	-	
Length of short nutrition course (days)				
1-5	33	9.61±2.09	68.39	Kruskal-Wallis Test=12.673, 4df **p=0.013**
6-10	42	10.21±2.02	79.08	
11-15	46	9.09±2.15	60.05	
16-20	2	9.00±4.24	65.25	
21-30	9	7.00±2.78	34.06	
Main source of nutrition information				
MIYCN guidelines	40	9.20±2.22	79.04	Kruskal-Wallis Test=12.494, 7df p=0.085
Nursing upgrading course	17	9.35±2.18	82.29	
Workshops/Seminars	23	9.91±2.21	91.52	
Professional experience	33	10.15±2.00	96.64	
Internet	28	7.60±2.59	48.85	
Professional journals	1	11.00±0.00	68.71	
Leaflets & brochures	10	9.50±2.46	121.50	
None	9	11.00±11.00	81.50	

4.5 Attitude of Respondents towards Maternal Nutritional Care

The mean attitude score of the respondents was 34.66±4.72 implying that generally, they had a high positive attitude. The least and highest scores being 15 and 40 respectively with a significant difference (**p=0.007**). The mean attitude score for male and female respondents was 34.58±5.33 and 34.68±4.56 respectively with no significant difference (p=0.800) as shown in table 21.

Table 21: Comparison of the Mean Attitude Scores of the Male and Female Respondents

	Sex	N=171	Mean(SD)	Mean Rank	Test Statistic
Attitude Score	Male	38	34.58±5.33	87.79	Mann Whitney U Test=2459
	Female	133	34.68±4.56	85.49	p=0.800

Table 22 shows the positive and negative responses to the attitude statements on maternal nutrition care. Nearly all the respondents (95.9%) had a positive attitude (score ≥ 25 points) towards maternal nutrition care. The areas with the highest agreement among the respondents were: importance of assessing nutritional status of all mothers (96.5%); counselling women on adequate and healthy weight gain in pregnancy (96.5%), that all women should be knowledgeable on the need for an adequate nutritious diet (95.9%); importance of maternal nutrition on improving pregnancy, child delivery and lactation outcomes (95.3%) and importance of pre-pregnancy nutrition (94.2%). Only a few of the respondents (14%) disagreed that assessing the nutritional status of mothers at the clinics and wards was one of the responsibilities of a nurse as shown in Table 22.

Table 22: Attitude towards Maternal Nutrition Care

Attitude Statement	N = 171	
	Agree n(%)	**Disagree n(%)**
1. Assessing the nutritional status of mothers at the clinics and wards is one of the responsibilities of a nurse	147 (86.0)	24 (14.0)
2. It is important to assess the nutritional status of all mothers admitted to the ward	165 (96.5)	6 (3.5)
3. All pregnant women and lactating mothers should be knowledgeable about the need for an adequate and nutritious diet	164 (95.9)	7 (4.1)
4. All women should be encouraged to take iron/folate tablets during pregnancy irrespective of their haemoglobin levels	156 (91.2)	15 (8.8)
5. All women should be counselled on adequate and healthy weight gain during pregnancy	165 (96.5)	6 (3.5)
6. All women at risk including adolescents, HIV-positive women, and women in emergency situations should receive special nutrition support	159 (93)	12 (7.0)
7. Pre-pregnancy nutrition influences a woman's ability to conceive, determines foetal growth and development as well as the health of the mother	161 (94.2)	10 (5.8)
8. Underweight and overweight women experience more complications during pregnancy and delivery than normal women	151 (88.3)	20 (11.7)
9. Good maternal nutrition is important for a successful pregnancy, child delivery and lactation	163 (95.3)	8(4.7)
10. Educating mothers on the importance of a healthy and nutritious diet is a nurse's responsibility	151 (88.3)	20 (11.7)

The respondents were asked to state the role(s) of a nurse in the nutritional management and care of pregnant mothers. Over half (53.4%) of the respondents cited nutrition education; one fifth (20.4%) stated both assessment of nutritional status and nutrition education and 9.6% cited monitoring the progress and referral to the nutritionist. Other important responses included health education (8.4%), offering nutrition supplements including IFAS and assisting patients to feed (8.2%) as demonstrated in figure 5.

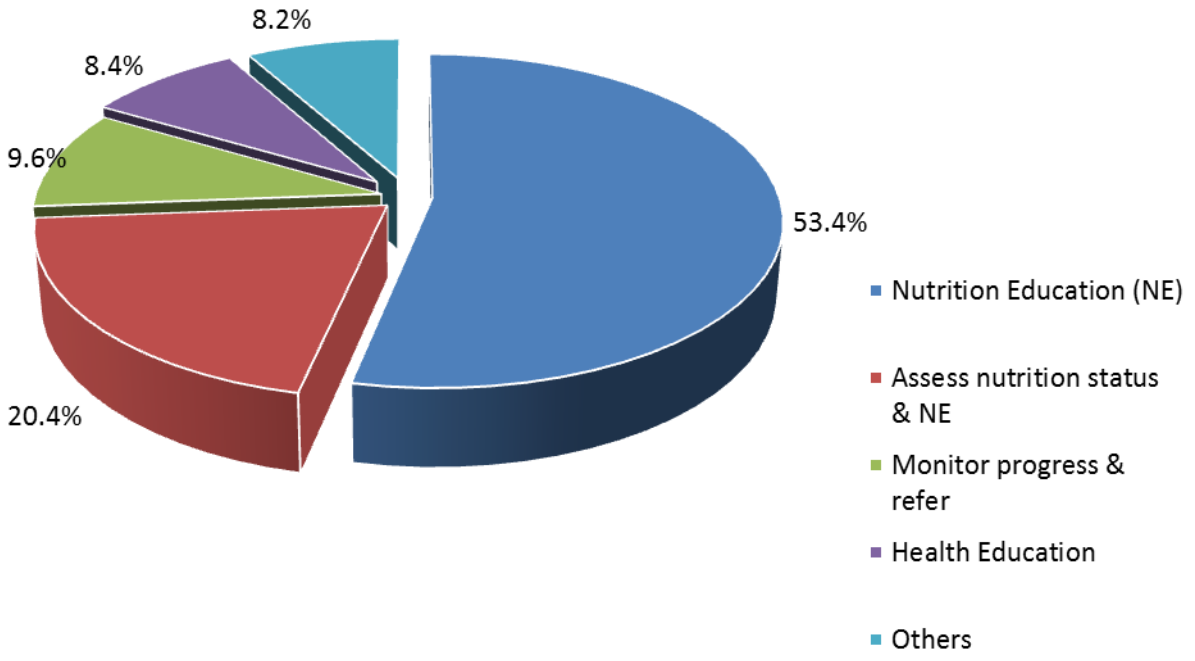

Figure 5: Roles of a nurse in the nutrition management and care of pregnant mothers

Information was obtained from five key informants who were senior nurses in charge of each of the four maternity wards and the ANC about maternal nutrition care practices of nurses at KNH. When asked about who was involved in the nutritional care of pregnant mothers at the clinic and wards, the informants emphasized that the nutritionists are the key experts in the nutritional care of pregnant mothers. They felt that it is their primary responsibility while nurses play an assisting role. They reported that the major role the nurses played in the

nutritional management and care of pregnant mothers is providing education on good nutrition. Other roles include monitoring the patients' food intake and identifying nutrition related problems.

There were no significant associations between attitude and sociodemographic characteristics or nutrition training background ($p>0.05$).

4.6 Maternal Nutrition Care Practices of the Respondents

Table 23 shows the mean scores for the maternal nutrition care practices of the respondents while Table 24 illustrates the responses to the maternal nutrition care practices. Generally, majority of the respondents reported that they frequently provided maternal nutrition care to women within their units. The average practice score was 5.11±1.26 with the least and highest scores being 1 and 7 respectively. The average practice scores for male and female respondents are as shown in Table 23. There was no significant difference between the mean maternal practice scores for male and female respondents (p=0.244).

Table 23: Mean Maternal Nutrition Practice Scores of Males and Females

	Sex	N=171	Mean	SD	Test Statistic
Practice Score	Male	38	4.89	1.25	t=-1.17, 169df, p=0.244
	Female	133	5.17	1.26	

Over three quarters of the respondents (76.0%) reported that they regularly weighed pregnant mothers while (11.7%) did not (Table 24). Some of the reasons cited by the respondents for not taking weight measurements included an assumption that mothers were always weighed at the ANC and hence did not see a need to repeat the measurements in the wards, heavy work load in the wards, and that it was not a priority and standard practice in some areas such as Labour Ward and the Youth Centre.

To verify the information on maternal nutrition care practices of the respondents, an obseravtion was conducted over a period of one week in the four key units that directly provide antenatal care to pregnant women.

It was observed that in most (75%) of the units within the RH department, nurses did not weigh nor provide nutrition education to pregnant women. Weighing of mothers was only done by nurses at the ANC daily while education of mothers was done by nutritionists in both the wards and clinics.

Majority of the respondents indicated that they always educated pregnant women on the importance of a healthy well balanced diet (89.5%) and encouraged them to take IFAS during pregnancy (93.6%) as shown in Table 24. A reason cited by one of the 5(2.6%) respondents who did not encourage mothers to take IFAS during pregnancy was that supplements should only be prescribed based on the individual need and health status of the mothers. On the contrary, direct observation of this practice showed that pregnant women were issued with prescriptions for IFAS mainly at the ANC and irregularly for women admitted in the wards.

Over two thirds of the respondents (70.2%) indicated that they always discussed the nutritional status and management of pregnant women with other team colleagues during ward rounds or clinic visits while (23.4%) did it sometimes. Those who did not (6.4%) cited heavy work load, while one indicated that it was not a usual practice except in the case of a clinically wasted patient.

Table 24: Maternal Nutrition Care Practices of the Respondents

Maternal Nutrition Care Practice	Frequency (N=171)	Percent (%)
Weigh mothers often on admission or clinic visits		
Yes	130	76.0
No	21	12.3
Sometimes	20	11.7
Educate pregnant mothers on importance of a healthy diet		
Yes	153	89.5
No	2	1.2
Sometimes	16	9.4
Encourage mothers to take nutritional supplements and IFAS		
Yes	160	93.6
No	5	2.9
Sometimes	6	3.5
Discuss nutritional status and management with other colleagues during ward rounds or clinic visits		
Yes	120	70.2
No	11	6.4
Sometimes	40	23.4

The respondents were asked to state the measurements they would use to assess the nutritional status of pregnant women. Majority of the respondents (84.8%) indicated that they would use weight gain, MUAC, and diet history as opposed to vital signs (7.0%) or biochemistry (5.8%) as shown in Table 25 below.

The respondents were asked to indicate the action they would take for a patient who was not receiving adequate nutrition. Most (64.3%) said they would consult the nutritionist while a third 57(33.3%) noted that they would discuss with the patient possible diet options while only 4 respondents would refer to the doctor.

When asked about the reason that would motivate them to weigh patients, slightly over a third (36.3%) of the respondents reported obvious weight loss, poor appetite, and reduced food intake while almost a third (32.2%) noted for medication purposes while a fifth (19.9%) said the patients' medical condition as 20(11.7%) respondents gave no reason (Table 25).

Table 25: Maternal Nutrition Care Practices of the Respondents

Maternal Nutrition Care Practices	Frequency (N=171)	Percent (%)
Measurements to assess nutrition status of pregnant mothers		
Vital signs such as Bp, pulse rate, temp	12	7.0
Biochemistry	10	5.8
Weight gain, MUAC, diet history	145	84.8
Others	4	2.3
Action taken for a patient not receiving adequate nutrition		
Consult the nutritionist	110	64.3
Refer to doctor	4	2.3
Discuss with patient possible diet options	57	33.3
Reasons for weighing patients		
For medication purposes	55	32.2
Patients medical condition	34	19.9
Obvious weight loss, poor appetite, Reduced food intake	62	36.3
None	20	11.7

Figure 6 shows the anthropometric tools used by the respondents to assess the nutritional status of women within the RH department. The most commonly used anthropometric tool was the weight scale (64.3%) followed by the MUAC tape (5.8%) and height meter (3.5%) as a few (4.7%) of the respondents used a combination of the three anthropometric tools i.e. weight scales, height meter and MUAC tape. A small proportion (10.5%) used both a weight scale and height meter while (8.2%) did not use any anthropometric tool (Figure 6).

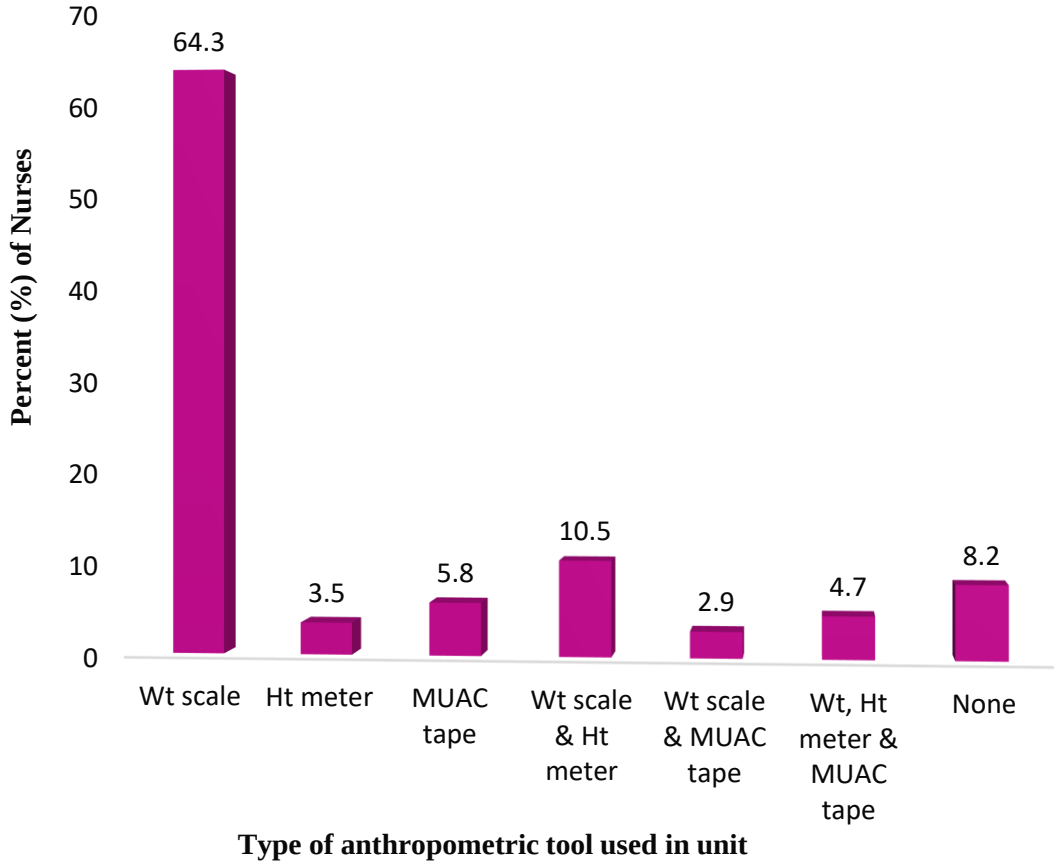

Figure 6: Anthropometric assessment tools used in the Reproductive Health Unit

From the direct observations, the nutrition assessment tools that were available in the wards and clinic included the adult weighing scale with an in-built height meter. Weighing of mothers was mostly done at the ANC but the height meter was rarely used. The Mid Upper Arm Circumference (MUAC) tape was neither available nor used in any of the units during the study period.

Overall, most (90.1%) of the respondents had appropriate maternal nutrition care practices. Respondents with appropriate and inappropriate maternal nutrition care practices were compared to identify the socio-demographic attributes that were significantly associated with appropriate practice.

Table 26 shows the relationship between nutrition training background factors of the respondents and their maternal nutrition care practices. The proportion of respondents with diplomas and appropriate maternal nutrition care practices was higher (92.6%) than those with certificates (88.9%) or undergraduate degree (83.8%) or post-graduate degrees (66.7%) but with no statistically significant differences (p=0.224). Similarly the proportion of respondents with nursing experience of over 5 years within the reproductive health department and with appropriate maternal nutrition care practices [5-9 years (90%), 10-15 years (100%), >15 years (86.4%)] was higher than those with under 5 years of experience [1-4 years (92.6%), <1 year (81.0%)] with no significant difference (p= 0.378). Respondents who indicated to have covered maternal nutrition in nursing training and those who noted to have attended a short course on maternal nutrition had higher rates of appropriate practices (90.8% and 90.9%) respectively compared to those who had not (87.2% and 69.2%), with no significant differences (p>0.05) as shown in Table 26.

Table 26: Associations between Nutrition Training Background and Maternal Nutrition Care Practices

		Maternal Nutrition Care Practices		
Characteristic/factor	**N=171**	**Inappropriate**	**Appropriate**	**Test Statistic**
Academic qualification				
Certificate	9	1 (11.1)	8 (88.9)	χ^2=4.370, 3df
Diploma	122	9 (7.4)	113 (92.6)	p=0.224
Undergraduate degree	37	6 (16.2)	31(83.8)	
Post-graduate degree	3	1(33.3)	2 (66.7)	
Nursing experience (years)				
<1 year	21	4 (19.0)	17 (81.0)	χ^2=4.213, 4df
1-4	54	4 (7.4)	50 (92.6)	p=0.378
5-9	60	6 (10.0)	54 (90.0)	
10-15	14	0 (0.0)	14 (100.0)	
>15	22	3(13.6)	19 (86.4)	
Covered maternal nutrition topic				
Yes	152	14 (9.2)	138 (90.8)	χ^2=0.720, 1df
No	19	3 (15.8)	16 (84.2)	p=0.409
Attended short maternal nutrition course				
Yes	132	12 (9.1)	120 (90.9)	χ^2=0.443, 1df
No	39	5 (12.8)	34(87.2)	p=0.544

Table 27 shows additional nutrition training background characteristics of the respondents including length of nutrition training, duration since last attended a professional training on nutrition, main source of information and reference on maternal nutrition, knowledge on where and how to find information and reference materials, and knowledge on regular update of main sources of information and reference materials used. These did not show any significant association with appropriate maternal nutrition care practices ($p>0.05$).

Table 27: Associations between Nutrition Training Background and Maternal Nutrition Care Practices

	Maternal Nutrition Care Practices			
Characteristic/factor	**N=171**	**Inappropriate n(%)**	**Appropriate n(%)**	**Test Statistic**
Length of nutrition training (days)				
1-5	33	4 (12.1)	29 (87.9)	χ^2=7.614, 4df
6-10	42	2 (4.8)	40 (95.2)	p=0.107
11-15	46	3 (6.5)	43 (93.5)	
16-20	2	1 (50.0)	1 (50.0)	
21-30	9	2(22.2)	7 (77.7)	
Main source of maternal nutrition information				
MIYCN guidelines	40	2 (5.0)	38 (82.5)	χ^2=0.049, 8df
Nursing upgrading course	17	1 (5.9)	16 (88.2)	p=0.976
Workshops/Training seminars	23	1 (4.3)	22 (82.6)	
Professional experience	33	4 (12.1)	29 (66.7)	
Personal experience	10	0 (0.0)	10 (100.0)	
Internet	28	5(17.9)	23 (82.1)	
Professional journals	1	1 (100.0)	0 (0.0)	
Leaflets & brochures	10	1 (10.0)	9 (90.0)	
None	9	2 (22.2)	7 (77.8)	
Knowledge on where and how to get information				
Yes	145	15 (10.3)	130 (89.7)	χ^2=0.184, 1df
No	26	2 (7.7)	24 (92.3)	p=0.749
Knowledge on regular update of main source of information				
Yes	90	6 (6.7)	84 (93.3)	χ^2=3.407, 2df
No	40	4 (10.0)	36 (90.0)	P=0.182
Don’t know	41	7 (17.1)	34 (82.9)	

However, the key informants said that the nutritional care provided to pregnant mothers by nurses may not be adequate since nutrition care is not the primary responsibility of the nurse. Furthermore, nurses have a heavy workload in view of the high patient turnover in the wards and ANC owing to the free maternity care the hospital provides they noted. Nurses therefore are obliged to focus on their key responsibilities which include admission of patients, bed making, monitoring of vital signs, issuing of medication, and documenting patients' progress among other duties. However, normally nurses work alongside the nutritionist to ensure that any nutrition problems the patients have are appropriately addressed they noted.

They reported that the main challenges nurses face in the provision of maternal nutrition care include heavy workload hence nutrition care is not given priority due to lack of time, priority of care is given to the postnatal mothers masking the importance of nutrition care to pregnant women, limited knowledge which is not up-to-date due to irregular training opportunities, and lack the appropriate nutrition assessment tools for pregnant women in the wards.

4.7 Relationships between Maternal Nutrition Knowledge, Attitude and Care Practices

4.7.1 Maternal Nutrition Care Practices versus Attitude

Majority 151(89.9%) of the respondents who had a positive attitude also reported appropriate maternal nutrition care practices and so did those with a negative attitude 3(100%) as shown in Table 28. There was no significant association between maternal nutrition care practices and attitude of the respondents ($p>0.05$).

Table 28: Maternal Nutrition Care Practices and Attitude

	Maternal Nutrition Care Practices		
Type of Attitude	**N=171**	**Inappropriate n (%)**	**Appropriate n (%)**
Positive	168	17 (10.1)	151 (89.9)
Negative	3	0 (0.0)	3 (100.0)

4.7.2 Maternal Nutrition Knowledge versus Attitude

Table 29 shows the relationship between maternal nutrition knowledge and attitude. At an error rate of 5%, there was a significant relationship between maternal nutrition knowledge and attitude among the respondents (**p=0.007**). The results indicated that respondents who had adequate knowledge on maternal nutrition were more than **five times** more likely to have a positive attitude towards maternal nutrition as compared to those with inadequate maternal nutrition knowledge (**OR=5.42**, CI[3.94-7.45], **p=0.007**).

Table 29: Association between Knowledge of Maternal Nutrition and Attitude

Maternal Nutrition Knowledge (N=171)			
Type of Attitude	**Inadequate n(%)**	**Adequate n(%)**	**Test Statistic**
Negative	3 (100%)	0 (0%)	χ^2=9.912, 1df p=**0.007**
Positive	31 (20%)	137 (80%)	

4.7.3 Knowledge of Maternal Nutrition versus Practices

Maternal nutrition knowledge was not significantly associated with practices of the respondents (p=0.530). There were 122(79.2%) respondents with adequate knowledge who had appropriate practices compared to 15(88.2%) with adequate knowledge and inappropriate practices (Table 30).

Table 30: Association between Knowledge of Maternal Nutrition and Practices

Maternal Nutrition Knowledge				
Type of practice	**N=171**	**Inadequate n(%)**	**Adequate n(%)**	**Test statistic**
Inappropriate	17	2 (11.8)	15 (88.2)	χ^2=0.873, 1df p=0.530
Appropriate	154	32 (20.8)	122 (79.2)	

A regression analysis was performed to test the relationship between one continuous dependent variable (maternal nutrition knowledge) with four independent variables, namely, attitude, practice, age and length of short course on maternal nutrition where a significant model emerged (F4, 127=8.2, **p<0.001**) as shown in Table 31. Approximately 21% of the variation in maternal nutrition knowledge among the respondents was partially explained by the model (R^2=0.205). Attitude towards maternal nutrition (**p=0.000**) and length of short

professional training course on maternal nutrition (**p=0.002**) were significant predictors of maternal nutrition knowledge of the respondents.

Table 31: Multiple Linear Regression between Maternal Nutrition Knowledge and Attitude, Age, Length of Short Professional Course and Practices

	Unstandardized Coefficients		Standardized Coefficients		
Predictor factors	**B**	**Std. Error**	**Beta**	**t**	**p**
(Constant)	5.503	1.626		3.385	.000
Attitude score	.165	.037	.353	4.426	**.000**
Age	-.005	.019	-.023	-.287	.774
Length of short professional course	-.098	.030	-.257	-3.239	**.002**
Practice Score	-.108	.142	-.060	-.759	.449

Dependent Variable: Knowledge Score

Similarly, a regression analysis was performed to determine factors related with attitude of respondents towards maternal nutrition which resulted to a statistically significant model (F4, 127=5.5, **p=0.000**) shown in Table 32. Approximately 15% of the variation in attitude towards maternal nutrition care was partially explained by the model (R^2=0.148). The model showed that knowledge of maternal nutrition was a highly significant predictor of the respondents' attitude (**p=0.000**).

Table 32: Multiple Linear Regression between and Attitude and Age, Length of Short Professional Course, Practices, and Maternal Nutrition Knowledge

	Unstandardized Coefficients		Standardized Coefficients		
Predictor factors	**B**	**Std. Error**	**Beta**	**t**	**p**
(Constant)	23.537	3.136		7.505	.000
Age	.040	.041	.080	.973	.333
Length of short professional course	.024	.070	.029	.340	.735
Practice Score	.295	.315	.077	.937	.350
Knowledge score	.812	.183	.379	4.426	**.000**

Dependent Variable: Attitude score

A regression model to establish factors associated with maternal nutrition care practices was not statistically significant ($F_{4, 127}$=0.302, p=0.876) (Table 33).

Table 33: Multiple Linear Regression between Practices and Age, Length of Short Professional Course, Maternal Nutrition Knowledge and Attitude

	Unstandardized Coefficients		Standardized Coefficients		
Predictor Factor	**B**	**Std. Error**	**Beta**	**t**	**P**
(Constant)	4.709	.973		4.837	.000
Age	.003	.012	.025	.267	.783
Length of short professional course	-.002	.020	-.015	-.165	.869
Knowledge Score	-.042	.055	-.075	-.759	.449
Attitude score	.023	.025	.089	.937	.350

Dependant Variable: Practice score

A One-Way Multi-variate Analysis of Variance (MANOVA) showed that there was a statistically significant difference in the mean attitude and practice scores of the respondents based on their maternal nutrition knowledge (F4, 334)=5.7, **p<0.001**; Wilk's Lamda=0.88, partial η^2 = .064.

Further analysis showed that maternal nutrition knowledge of the respondents produced a statistically significant effect on attitude ($F_{2, 168}$) =11.29, **p=0.000**, partial η^2 = .119) and not on maternal nutrition practice ($F_{2, 168}$ =0.33, p=0.720, partial η^2 = .004) as shown in Table 34.

Table 34: Tests of between Subject Effects

Source	Dependent Variable (Scores)	Type III Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Corrected	Attitude	448.959	2	224.480	11.292	.000	.119
Model	Practice	1.056	2	.528	.330	.720	.004
Intercept	Attitude	178548.522	1	178548.522	8981.733	.000	.982
	Practice	3998.977	1	3998.977	2497.047	.000	.937
Knowledge	Attitude	448.959	2	224.480	11.292	**.000**	.119
	Practice	1.056	2	.528	.330	.720	.004

Table 35 shows that attitude scores significantly differed among respondents with poor maternal nutrition knowledge compared with those with moderate maternal nutrition knowledge (**p=0.005**), poor maternal nutrition knowledge and good maternal nutrition knowledge (**p<0.001**) but not between those with moderate maternal nutrition knowledge against those with good maternal nutrition knowledge (p=0.094).

Table 35: Comparisons of Attitude and Level of Maternal Nutrition Knowledge

Dependent Variable	Knowledge Levels(I)	Knowledge Levels(J)	Mean Difference (I-J)	Standard Error	p
Attitude score	Poor	Moderate	-2.94	.92	**.005**
	Good	Poor	4.54	.96	**.000**
	Good	Moderate	1.60	.77	.094
Practice Score	Poor	Moderate	.12	.26	.893
	Poor	Good	.22	.27	.701
	Good	Moderate	-.10	.22	.890

Figure 7 shows a graphical representation of differences in mean attitude scores of the nurses across different levels of nutrition knowledge.

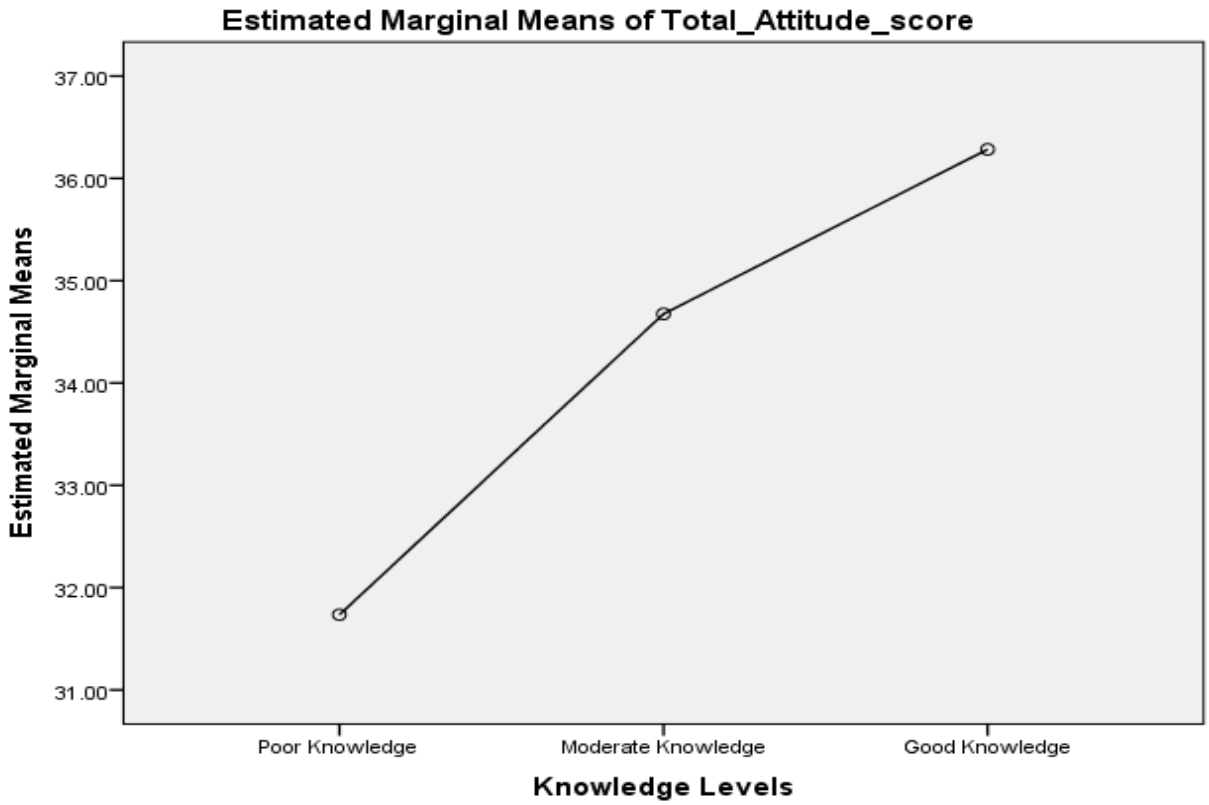

Figure 7: Differences in mean attitude scores against maternal nutrition knowledge levels.

Kruskall-Wallis non parametric test indicated a significant association between the length of the short professional training course on maternal nutrition and mean knowledge scores (**p=0.013**) (Table 36). It was observed that the mean knowledge scores of those respondents who had attended nutrition training course for shorter periods (1-5 days and 6-10 days) were higher than for those who had attended for longer (11-15 days, 16-20 days, and 21-30 days). A Post hoc ANOVA test further showed that the mean knowledge scores of the respondents who had attended short training courses lasting 1 – 5 days and 6 – 10 days were significantly higher (**p=0.015** and **p=0.001** respectively) than those who had attended for 21 – 30 days.

Table 36: Mean Knowledge Scores and Length of Short Professional Course Training

Length of T raining (days)	N=132	Mean Knowledge Scores (SD)	Mean Ranks	Test Statistic
1-5	33	9.61±2.09	68.39	
6-10	42	10.21±2.02	79.08	Kruskall-Wallis
11-15	46	9.09±2.15	60.05	Test=0.673, 4df
16-20	2	9.00±4.24	65.25	**p=0.013**
21-30	9	7.00±2.78	34.06	

Figure 9 shows the graphical representation of mean knowledge scores of the respondents across different lengths of nutrition training.

Figure 8: Differences in mean knowledge scores against the length of short professional maternal nutrition course

CHAPTER 5: DISCUSSION

5.1 Introduction

This chapter presents the discussion of the findings on the nutrition training background of nurses, knowledge of the nurses on maternal nutrition, attitude of nurses towards maternal nutrition care, and maternal nutrition care practices of nurses at Kenyatta National Hospital. The chapter also presents the conclusions and recommendations for policy and practice.

5.2 Discussion of the Findings

It is evident that maternal nutrition during pregnancy is important as it may influence the course of the pregnancy, foetal development and the child's health and life in its entirety (Szostak-Wegierek, 2000). Good maternal nutrition is the cornerstone for a successful pregnancy outcome. The findings of this study confirm that nurses consider maternal nutrition essential in the care of pregnant women. This is in agreement with a study done by Ilmonen, Isolauri and Laitinen (2012) that showed that nurses considered nutrition counselling important for pregnant mothers.

Approximately 71.3% of the nurses were diploma holders while 23.4% were bachelor and master degrees holders and the rest certificate holders. These results differ with those from developed countries where in a report on US nursing workforce almost half of them were bachelor degree holders (44.6%), slightly more than a third were associate nurses (37.9%) with only 7% registered diploma nurses (HRSA, 2013). According to KNW (2012) report, national referral hospitals employed more diploma registered nurses (72.8%) compared to 22.7% certificate enrolled nurses and 4.5% degree BScN nurses. The lower number of certificate enrolled nurses and higher number of degree BScN nurses in this study compared to the KNW (2012) report could be explained by the fact that KNH being the largest national referral, research, and training health facility in the country and region, invests in training its workforce by providing opportunities for upgrading professional and academic qualifications due to the specialized nature of the healthcare services provided.

Most of the nurses in this study had covered the topic on maternal nutrition during their nursing training. Over three quarters of them had attended short in-service training courses addressing maternal nutrition, nevertheless, more than half were not aware of the regularity of such courses. However, attending an in service course or covering the topic on maternal nutrition during nursing training or having higher academic qualifications which ordinarily is expected to enhance knowledge, surprisingly did not significantly result to better knowledge scores or more positive attitudes of the nurses. Probably the area of nutrition in the nursing training curriculum in Kenya is not harmonised across the certificate, diploma, degree and postgraduate programs and may be inadequate in content (Kobe, 2006).

A study designed to examine nutrition training in nursing and medical schools in West Africa revealed that nutrition training was mainly basic and/or shallow in content in the former and biased towards clinical in the medical schools. The report established important gaps in the nursing nutrition curricula including limited contact hours in public health nutrition which when addressed would enhance the nutrition skills of the nursing workforce (Global Health Action, 2014). Other studies elsewhere have established that nutrition is not adequately taught in nursing schools, neither is it given serious considerations in health service delivery (Stotts et al., 1987; Kowanko et al., 1999; Crogan et al., 2001; Allison et al., 2004; Mowe et al., 2008). Further, a Turkish study among nurses in public hospitals revealed the discontent among nurses with the nutrition education during their nursing training where almost half (47.7%) of them argued that it was given little importance and/or consideration (Nurdan et al., 2013).

The mean knowledge score of the nurses was above average (mean score of 9.46 out of 15) with only 19.9% (one in every 5 nurses) having inadequate knowledge (score < 7). Nevertheless, the nurses performed well in some topics than others. Areas that nurses had poor knowledge included the recommended weight gain during pregnancy, optimal gestation period for storage of iron, fat and calcium, definition of physiological anaemia, and recommended increase in energy intake during pregnancy. These findings agree with Barrowclough and Ford (2010) that midwives had poor knowledge in areas such as recommended increase in energy requirements, recommended weight gain and women at risk of iron-deficiency anaemia. Inappropriate knowledge could lead to misinformation on the

correct dietary practices and missed diagnosis of nutritional problems in the women, contributing to malnutrition.

On the contrary, nearly three quarters of the nurses displayed high levels of knowledge on issues such as the desirable goal for a successful pregnancy; definition of pica; avoidance of alcohol in pregnancy and lactation, factors that increase the risk of delivering a premature or small for gestational age infant, and factors likely to pose a risk to maternal and foetal health during pregnancy.

Study findings show that though not statistically significant, nurses with higher academic qualifications had higher mean knowledge scores. This could be explained by the fact that nutrition is considered an important course unit and is allocated more training hours in undergraduate training curriculum (appendix 8). This is evident in nursing curriculum for the University of Nairobi that includes a unit on *nutrition and health* allocated 90 contact hours and it covers aspects on nutrition during pregnancy and lactation, nutritional counselling and nutrition education principles among others in the degree course. The study established that academic qualification and attendance of short courses addressing maternal nutrition had no significant association with knowledge on maternal nutrition.

The main source of maternal nutrition information reported by the nurses was MIYCN policy guidelines. This concurs with study findings by Elias and Green (2007) in New Zealand which showed that the main source for nutrition information for the midwives was the ministry of health documents such as guidelines and pamphlets. Another study in the UK revealed that practice nurses mainly obtained their maternal nutrition information from professional journals (NNSC and HSE, 2010). It was interesting to note that other important sources of information and reference materials in this study included professional experience other than the internet. The differences in the main sources of information may be attributed to ease of accessibility to various sources of information among the groups. However, it is important that nurses obtain information from evidence based sources. This helps in standardizing information given to mothers in order to reduce confusion thereby ensuring quality service delivery. Further, Crogan and Evans (2001) showed that clinical experience of

nurses does not increase knowledge scores and found nutrition education was positively correlated with nutrition knowledge. This finding therefore highlights the need for more emphasis on nutrition education for nurses.

There was a significant association between attitude towards maternal nutrition care and regularity of the trainings. All nurses who did not know the regularity of the trainings had a more positive attitude compared with those who indicated that they were held more regularly. The frequency of the training did not seem to influence the positivity of their attitude.

Majority of the nurses reported that they observed the recommended maternal nutrition practices including weighing mothers often in the clinic and wards, encouraging mothers to take IFAS daily, educating women on the importance of a healthy diet, use of weight, MUAC, and diet history to assess nutritional status of pregnant women, and weighed mothers often on admission or clinic visits. Contrary to what the nurses reported, it was observed that the nurses in the wards did not actually perform these tasks except at the ANC clinic. It was evident that maternal nutrition care was provided by the nutritionists in the wards while the nurses routinely weighed mothers at the ANC clinic while the nutritionist provided nutrition education to the mothers. Even though all the wards and units had a weighing scale with a height meter, mothers were rarely weighed unless for purposes of calculating medication dosages. The use of MUAC tapes was not observed anywhere in the wards or clinics.

As much as the majority of the nurses reported that they weighed mothers often on admission or clinic visit, nearly half of them did not know the recommended weight gain in pregnancy for healthy women. The nurses at the ANC clinic routinely weighed mothers as a standard nursing practice rather than for purposes of monitoring appropriate weight gain in pregnancy. According to Walker (2007) monitoring weight gain in pregnancy should be done by the primary healthcare provider and the progress reviewed with the pregnant women regularly.

Weight monitoring during pregnancy is important because a woman who does not gain enough weight is at greater risk of having a low birth weight baby and is also at increased risk of pre-term delivery (Health Canada, 2009). Consequently, the nurses had poor knowledge on differentiating between small for gestation age and low birth weight which are both possible outcomes of poor nutrition during pregnancy leading to inadequate weight gain in pregnancy.

The nurses preferred to consult a nutritionist or discuss with the patient possible diet options when they encountered a mother who is not receiving adequate nutrition than refer cases to doctors. This is a clear indication that the nurses trusted the nutritionist as the lead expert to provide recommendations on the appropriate nutrition interventions for mothers. The nurses felt that it was the primary responsibility of the nutritionist to provide nutritional care to patients while they played an assisting role and hence was not accorded much attention and focus. According to the key informants, the nutrition care provided by nurses was not adequate. One of the main reasons cited was the heavy workload due to the high patient burden owing to the free maternity services. As a result priority is given to key nursing duties such as issuing of medication, monitoring of vital signs, recording fluid input and output, attending ward rounds, bed making, among others. Generally there was greater attention and support for postnatal mothers than antenatal mothers in the wards.

Though not statistically significant, the results showed that nurses with diploma were more likely to perform the recommended practices compared to degree or BScN/MSc holders. This could be explained by the fact that nurses with higher qualifications might have been holding administrative positions and hence less involved in practical nursing care duties. Similarly, nurses who had covered maternal nutrition content within their nursing training curriculum and those who had attended short professional training courses had higher rates of appropriate practices. There is a possibility that training could have an influence on an individual's decision and ability to carry out a certain responsibility as a result of the state of awareness and knowledge obtained.

The results showed that attitude and length of short professional trainings on maternal nutrition were significant predictors of maternal nutrition knowledge. Nurses who had adequate knowledge on maternal nutrition were more than **five times** more likely to have a positive attitude towards maternal nutrition care as compared to those with inadequate maternal nutrition knowledge. Nurses with poor maternal nutrition knowledge had lower mean attitude scores compared with those who had moderate maternal nutrition knowledge or good maternal nutrition knowledge. These findings agree with those of Kobe (2006) that nurses who regarded nutrition care of patients as important had higher knowledge scores than those who did not. It was also observed that the mean knowledge scores of the nurses who

had attended training courses for shorter periods (1-5 days and 6-10 days) were significantly higher than for those who had attended for longer duration (21-30 days). This is an interesting finding that implies that longer trainings may not necessarily result in increased knowledge, and points out the need to focus on shorter days professional trainings.

The study did not establish any relationship between maternal nutrition care practices of the nurses and their knowledge or attitude. Majority of the nurses who had a positive attitude also had appropriate maternal nutrition care practices. However, it was interesting to note that the proportion of nurses with adequate knowledge and inappropriate practices was slightly higher than those with adequate knowledge and appropriate practices. These findings point to a possible disconnect between maternal nutrition knowledge and attitude with care practices of the nurses. Their knowledge and hgh positive attitude towards maternal nutrition care did not seem to influence their care practices. These findings agree with Kobe (2006) findings that there was no significant association between attitude and practices of nurses at Kenyatta National Hospital. This is a cause for concern in view of the responsibility that nurses are entrusted with in the care of patients. Inappropriate maternal nutrition care of mothers in hospital settings may be one of the contributing factors to increased risk of malnutrition and adverse pregnancy and birth outcomes.

5.3 Conclusion

This study has shown that the knowledge of maternal nutrition of nurses at KNH is above average and they consider maternal nutrition to be important in the care of pregnant women. The attitude and length of short professional trainings on maternal nutrition are significant predictors of their knowledge. Despite their level of knowledge of maternal nutrition, the care practices of the nurses seemed to contradict their attitude. This reveals a missing link between the maternal nutrition knowledge, attitude and practices of the nurses that needs to be addressed in view of the roles nurses play in providing nutritional care to patients.

5.4 Recommendations

1. Short professional training courses on maternal nutrition for nurses should not take longer than 10 days as this would be impactful in increasing their level of knowledge and the numbers trained as well.

2. There is need to foster teamwork among nurses and nutritionists working at the Reproductive Health department to improve the quality of maternal nutrition care.

3. In-service nutrition trainings for nurses on maternal nutrition should incorporate on-job-training approaches and supportive supervision to holistically enhance knowledge, attitude and skills development which in turn will result to improved quality of care in maternal nutrition.

4. Maternal nutrition guidelines and reference materials accompanied by job aids should be made available and placed in critical areas where all nurses can refer and their use periodically monitored.

5. There is need to develop an information system that enables input of biometric data, provides for analysis, querying and retrieval of reports. This will enhance the efficiency and effectiveness of operations within the RH department which in turn contributes to improved quality of maternal care.

6. Further research is required to assess the factors that determine the maternal nutrition knowledge, attitude and care practices of nurses so as to generate data that is informative and useful in developing appropriate interventions to address gaps that may exist.

7. Similar studies should be carried out in other health facilities within the country to establish the situation and generate more data that can be used to inform policy and development of standards of maternal nutrition care in Kenya.

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APPENDIX 1: STUDY QUESTIONNAIRE

MATERNAL NUTRITION KNOWLEDGE, ATTITUDES AND PRACTICES OF NURSES: A CASE STUDY OF KENYATTA NATIONAL HOSPITAL, NAIROBI, KENYA

Questionnaire Number….……

Name of Interviewer……..……..…… Date……..

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS

Please circle or fill in the most appropriate response where applicable

1. Sex
    1) Male
    2) Female

2. What is your age in years? _____

3. What is your marital status now?
    1) Married
    2) Not Married

SECTION B: NURSES NUTRITION TRAINING BACKGROUND

4. What is your highest level of nursing training?
    1) Certificate
    2) Diploma
    3) Degree
    4) Postgraduate (Masters/PhD)

5. What is your professional qualification?
    1) KEM
    2) KECHN
    3) KRM
    4) KRCHN
    5) KRN
    6) BScN
    7) MScN

6. What is your nursing experience in months or years at the Reproductive Health department?
    1) 3months to 1 year
    2) 1 – 4 year(s)
    3) 5 – 9 years
    4) 10 – 15 years
    5) More than 15 years

7. Was the topic on maternal nutrition a part of your training in nursing training?
    1) Yes
    2) No

8. Apart from nursing school training, have you attended any short course professional training addressing maternal nutrition? (Examples: Lactation Management course, Infant and Young Child Feeding (IYCF) course, Prevention Mother To Child Transmission of HIV (PMTCT) Course or any other Continuous Professional Development (CPD) courses on Nutrition)
    1) Yes
    2) No

9. If so, how long was the training?

   _____ day(s)

10. How regularly are these trainings offered?

1) Quarterly	4) Once every 3 years
2) Bi-annually	5) Never
3) Annually	6) I don't know

11. When was the last time you attended a professional training session on nutrition?

1) Less than 2 years ago	3) More than 5 years ago
2) 2 – 5 years ago	4) Never attended

12. During the last 2 years, what has been **your main source (one)** of information and reference on maternal nutrition
    1) Maternal, Infant and Young Child Nutrition National Policy Guidelines
    2) Nursing upgrading course
    3) Training seminars and workshops
    4) Professional experience (on the job)
    5) Personal experience
    6) Internet
    7) Professional journals
    8) Leaflets and Brochures
    9) Others, please specify _____
    10) None

13. Do you know where and how to find the information and reference sources you have selected above?
    1) Yes
    2) No

14. Are the sources of information and reference materials you selected in Question 12 regularly updated?
    1) Yes
    2) No
    3) I don't know

SECTION C: PRACTICES

15. 1. If **you were** to assess the nutritional status of a pregnant mother, what measurements **would you** use?

    1) Vital signs like blood pressure, pulse rate, temperature
    2) Weight gain, Mid Upper Arm Circumference (MUAC), diet history
    3) Blood biochemistry
    4) Others (specify _____)

16. Do you weigh mothers often on admission or clinic visit?
    1) Yes
    2) No
    3) Sometimes

17. If your answer to question 16 above is [(2) No] please explain the reason why?
    _____
    _____

18. Which of the following anthropometric assessment tools do you use on women in your unit?
    1) Weight Scale
    2) Height meter / Stadiometer
    3) Mid Upper Arm Circumference (MUAC) tape
    4) Others, please specify _____
    5) None

19. If your answer to question 18 is [(5) none], please give the reason why.
    _____
    _____

20. Do you always educate pregnant mothers in the ward/clinic on the importance of eating a healthy and well balanced diet?
    1) Yes
    2) No
    3) Sometimes

21. If your answer to question 20 is [(2) No], please explain why.
    _____
    _____

22. Do you always encourage pregnant mothers to take nutritional supplements containing Iron and Folic Acid (IFAS) daily during their duration of pregnancy?
    1) Yes
    2) No
    3) Sometimes

23. If your answer to question 22 is [(2) No], please explain why.
    _____
    _____

24. Do you always discuss the nutritional status and nutritional management of pregnant mothers with other team colleagues during ward rounds or clinic visits?
    1) Yes
    2) No
    3) Sometimes

25. If your answer to question 24 is [(2) No], what could be the reason?

_____

_____

26. What action would you take if you observed that a patient was not receiving adequate nutrition?

    1) Consult the nutritionist

    2) Refer to the doctor

    3) Discuss with the patient possible diet options

    4) Others, please specify _____

27. If you were to weigh patients, what reasons would motivate you to do so?

    1) For medication purposes

    2) Because of the patients medical condition

    3) Obvious weight loss, poor appetite, and reduced food intake

    4) Others, please specify _____

SECTION D: KNOWLEDGE

28. A maternal practice that can be harmful to the foetus is:

    1) a low-carbohydrate diet.

    2) fasting.

    3) smoking.

    4) all of the above.

29. To produce a healthy infant, the mother should ideally have an adequate diet:

    1) during the 9 months she carries the infant.

    2) during the last trimester when the baby is growing so rapidly.

    3) during the second and third trimesters of pregnancy.

    4) beginning months before conception occurs and continuing through the period of lactation.

30. The third trimester is the main time for storage of:

1) iron, fat, and calcium.
2) iron, calcium, and folate.
3) vitamin D, vitamin K, and fat.
4) fat, calcium, and folate.

31. Infants born after normal gestation length but weighing less than 2.5Kg are labelled

1) low birth weight.
2) small for gestational age.
3) preterm.
4) normal, the smaller the better

32. The pregnant woman needs to increase her energy intake by about how many calories per day during the last two trimesters of pregnancy.

1) 100 kcal
2) 300 kcal
3) 500 kcal
4) 800 kcal

33. An energy source to avoid in pregnancy and lactation is:

1) fat.
2) protein.
3) carbohydrate.
4) alcohol.

34. An increased requirement for which nutrients during pregnancy is related to their roles in the synthesis of red blood cells.

1) vitamin E and vitamin C
2) niacin and copper
3) folate and vitamin B-12
4) protein and calcium

35. Weight gain in pregnancy for healthy women should usually be at least:

1) 7 to 12 Kg
2) 12 to 15 Kg
3) 13 to 18 Kg
4) 16 to 20 Kg

36. The practice of eating soil, clay, or laundry starch during pregnancy is called:

    1) meconium
    2) cretinism
    3) pica
    4) pregnancy-induced hypertension

37. Select the following factor that is **not likely** to pose a risk to maternal and foetal health during pregnancy and childbirth.

    1) underweight mother
    2) maternal age 15 years or under
    3) many closely spaced pregnancies
    4) maternal age of 30 to 35 years

38. The risk of delivering a premature or small for gestational age infant increases with maternal:

    1) smoking.
    2) alcohol consumption.
    3) illegal or improper drug use.
    4) all of the above.

39. Though it is impossible to exactly define a successful pregnancy, which of the following is a desirable goal:

    1) gestational period longer than 40 weeks.
    2) gestational period longer than 37 weeks.
    3) birth weight greater than 2500 grams.
    4) 2 and 3.

40. To avoid constipation, the pregnant woman should increase her intake of:

    1) milk and dairy products.
    2) whole-grain cereals, vegetables, and fruits.
    3) sugars and starches.
    4) lean meat, poultry, and fish.

41. The "physiological anaemia of pregnancy" is a result of a(n):

    1) increase in the mother's blood volume.
    2) decrease in the mother's iron absorption.
    3) decrease in the mother's water consumption.
    4) decrease in the mother's red blood cell production.

42. When should Iron and Folic Acid Supplements (IFAS) be taken by pregnant women?

1) in the first trimester
2) in the second trimester
3) in the third trimester
4) from conception to delivery

SECTION E: ATTITUDE

43. It is important to assess the nutritional status of all mothers admitted to the ward

1) Strongly agree 2) Agree 3) Disagree 4) Strongly disagree

44. Assessing the nutritional status of pregnant mothers at the clinics and wards is one of the responsibilities of the nurse

1) Strongly agree 2) Agree 3) Disagree 4) Strongly disagree

45. Underweight and overweight women experience more complications during pregnancy and delivery than normal women

1) Strongly agree 2) Agree 3) Disagree 4) Strongly disagree

46. All pregnant women and lactating mothers should be knowledgeable about the need for an adequate and nutritious diet

1) Strongly agree 2) Agree 3) Disagree 4) Strongly disagree

47. All women should be encouraged to take Iron and Folic Acid Supplements (IFAS) during pregnancy irrespective of their haemoglobin levels

1) Strongly agree 2) Agree 3) Disagree 4) Strongly disagree

48. All women should be counselled on adequate and healthy weight gain during pregnancy

1) Strongly agree 2) Agree 3) Disagree 4) Strongly disagree

49. All women at risk including adolescents, HIV-positive women, and women in emergency situations should receive special nutrition support

1) Strongly agree 2) Agree 3) Disagree 4) Strongly disagree

50. Pre-pregnancy nutrition influences a woman's ability to conceive, determines foetal growth and development as well as the health of the mother

1) Strongly agree 2) Agree 3) Disagree 4) Strongly disagree

51. Good maternal nutrition is important for a successful pregnancy, child delivery and lactation

    1) Strongly agree 2) Agree 3) Disagree 4) Strongly disagree

52. Educating mothers on the importance of healthy eating during pregnancy is one of the responsibilities of a nurse

    1) Strongly agree 2) Agree 3) Disagree 4) Strongly disagree

53. What do you think is the role of the nurse in the **nutritional management and care** of pregnant mothers?

    _____
    _____
    _____
    _____

Thank you for your time and participation in this study.

APPENDIX 2: KEY INFORMANT INTERVIEW GUIDE

MATERNAL NUTRITION KNOWLEDGE, ATTITUDES AND PRACTICES OF NURSES: A CASE STUDY OF KENYATTA NATIONAL HOSPITAL, NAIROBI, KENYA

Name of Interviewee…. Questionnaire No……..…..

Name of Interviewer……... Date…….……...

Introduction

Hello. I am conducting a study on *Maternal Nutrition Knowledge, Attitudes, and Practices of Nurses at Kenyatta National Hospital.* I would like to talk to you regarding general aspects of maternal nutrition care practices of nurses at the Reproductive Health department at KNH. The information you will provide will be confidential and your participation is entirely voluntary. Your responses will be completely anonymous during data analysis and presentation, and future publication of results; so please answer each question truthfully. The interview may take approximately 1 hour.

Questions

1) Who is involved in the nutritional care of pregnant mothers at the clinic and wards in KNH?
2) What role do nurses play in the nutritional management and care of pregnant mothers at the clinics and wards?
3) How adequate is the knowledge and skills of nurses to provide maternal nutrition care to pregnant women in the wards and clinic?
4) How adequate is the nutritional care provided to pregnant women by nurses at KNH?
5) What training programmes on maternal nutrition exist for health workers including nurses at KNH?
6) What reference materials and sources of information on maternal nutrition are available for use by nurses at KNH?
7) How regularly are these sources of information and reference materials you have mentioned above updated?
8) How do nurses at KNH access these reference materials on maternal nutrition?
9) What challenges do nurses incur in the provision of maternal nutrition care at KNH?
10) What role does KNH play to help nurses provide maternal nutrition care?

Thank you for your time and participation in this study.

APPENDIX 3: OBSERVATION GUIDE AT THE ANTE NATAL CLINIC

MATERNAL NUTRITION KNOWLEDGE, ATTITUDES AND PRACTICES OF NURSES: A CASE STUDY OF KENYATTA NATIONAL HOSPITAL, NAIROBI, KENYA

Name of Researcher _____

Date _____

Please observe the following practices and availability of the mentioned items at

Ward/ Clinic _____

1) Maternal nutrition care practices

	QUESTIONS ON TYPE OF NUTRITION PRACTICES	ANSWER 1)YES 2) NO
1.	Is the weight of pregnant women taken	
2.	Are pregnant women educated on the importance of healthy and nutritious diet?	
3.	Are pregnant women issued with prescriptions for Iron and Folic Acid supplements	
4.	Are pregnant women issued with information education materials such as leaflets, handouts or brochures	

2) Availability and use of the following nutrition assessment tools

TYPE OF NUTRITION ASSESSMENT TOOL	AVAILABILITY 1) YES 2) NO	USE 1) YES 2) NO
1. Adult Weighing Scale		
2. Stadiometer/Height Meter		
3. Mid Upper Arm Circumference (MUAC) tape		
4. Any other (list them) _____ _____ _____		

3) Guidelines and resource materials available on maternal nutrition

GUIDELINES/RESOURCE MATERIALS	AVAILABILITY 1) YES 2) NO	USE 1) YES 2) NO
1. National Maternal, Infant and Young Child Nutrition Policy		
2. Maternal, Infant and Young Child Nutrition Guidelines for Health Workers		
3. Take home brochure on "Nutrition during Pregnancy and Lactation"		

APPENDIX 4: CONSENT FORM

TITLE OF THE RESEARCH PROJECT: **MATERNAL NUTRITION KNOWLEDGE, ATTITUDES AND PRACTICES OF NURSES: A CASE STUDY OF KENYATTA NATIONAL HOSPITAL, NAIROBI, KENYA**

Introduction

How are you? My name is Agnes Sitati. I am a Master of Science in Applied Human Nutrition student at the Department of Food Science, Nutrition and Technology, University of Nairobi. I am conducting a study on *Maternal Nutrition Knowledge, Attitudes, and Practices of Nurses at Kenyatta National Hospital.*

Study Procedures

I would like to interview you on aspects regarding your socio-demographic characteristics, nutrition training background, knowledge on maternal nutrition, your attitude towards maternal nutrition care, and your maternal nutrition care practices at the Reproductive Health department, KNH. I respectfully request your participation in this study by completing the questionnaire attached by yourself or together with a member of the research team. You are selected as a possible participant because you are a nurse working at the Reproductive Health Department in KNH. It will take approximately 30-40 minutes to complete the questionnaire.

Objective of the study

The main objective of this study is to determine the maternal nutrition knowledge, attitude, and practices of nurses working at the Reproductive Health Department, Kenyatta National Hospital. The aim is to contribute towards improved service delivery in maternal nutrition care at public health facilities and consequently enhance the health and nutrition of women and children in Kenya at large.

Risks

There are no perceived risks for your participation. The completion of the questionnaire does not hold any dangers to yourself or your health.

Benefits

There are no direct benefits for yourself arising from the study; however, the research findings will provide data that may be used to improve policies and guidelines geared towards promoting the quality of knowledge, attitude and practices in maternal nutrition care at public health facilities in Kenya.

Ethical Issues and Confidentiality

You will not be paid to participate in the study nor any costs involved for you. Your participation is entirely voluntary. Refusal to participate or withdrawal of your consent or discontinued participation in the study will not result in any penalty or loss of benefits or rights to which you might otherwise be entitled. Your responses will be completely anonymous during data analysis and presentation, and dissemination of study findings.

Other Necessary Information

You are free to ask questions and seek clarifications about the study at any time through the contacts provided below:

PRINCIPAL INVESTIGATOR: AGNES NAMALWA SITATI

PHYSICAL ADDRESS: University of Nairobi, College of Agriculture and Veterinary Sciences, Faculty of Agriculture, Department of Foods, Nutrition, Dietetics and Technology

POSTAL ADDRESS: P.O BOX 13528-00100 NAIROBI

PHONE CONTACT: +254722678886; EMAIL: ansitati@gmail.com

KENYATTA NATIONAL HOSPITAL/UNIVERSITY OF NAIROBI ETHICS AND RESEARCH COMMITTEE SECRETARY: PROF. M.L. CHINDIA

PHONE CONTACT: +2542726300 Ext 44102

EMAIL: knhuonerc@gmail.com

By signing below, I voluntarily agree to take part in the above research titled; **Maternal Nutrition Knowledge, Attitudes and Practices of Nurses: A Case Study of Kenyatta National Hospital, Nairobi, Kenya.**

I declare that:

- The information in this consent form has been explained to me and is written in a language that I understand clearly.
- I understand that taking part in this study is voluntary and I have not been coerced to participate.
- I may choose to leave the study at any time without being penalized or prejudiced in any way.
- I have been assured of confidentiality of any information that I will give.

_____	_____	_____	_____
Participant's Signature	Date	Researcher	Date

APPENDIX 5: RESEARCH ASSISTANTS TRAINING PROGRAM

DAY	TIME	TOPIC	LEARNING METHOD	TOOLS
1	9.00–10.30 am	**Introduction, Objectives and Overview of the Study**	Lecture	○ Flip Chart ○ Pens ○ Notebooks
	10.30-11.00 am	TEA BREAK		
	11.00–1.00 pm	**Overview of the Data Collection Tools** ○ Semi-structured Questionnaire ○ Key Informant Interview Guide ○ Direct Observation Guide	Lecture	○ Semi-structured Questionnaire ○ Key Informant Interview Guide ○ Direct Observation Guide
	1.00-2.00 pm	LUNCH BREAK		
	2.00-4.00 pm	**Data Collection Techniques**	○ Lecture ○ Demonstration ○ Role Play	○ Flip Chart ○ Pens ○ Notebooks
	4.00-5.00 pm	**Research Ethics**	○ Lecture ○ Discussion	○ Flip Chart ○ Pens ○ Notebooks
2	9.00–10.30 am	**Recap of previous days content**	○ Presentation ○ Discussion	○ Notes ○ Data ○ Collection Tools
	10.30-11.00 am	TEA BREAK		
	11.00-1.00 pm	**Pre-test of the Data Collection Tools** ○ Semi-structured Questionnaire ○ Key Informant Interview Guide ○ Direct Observation Guide	○ Role Play	○ Semi-structured Questionnaire ○ Key Informant Interview Guide ○ Direct Observation Guide
	1.00-2.00 pm	LUNCH BREAK		
	2.00-4.00 PM	**Work Plans and Conclusion**	○ Discussion	○ Pens ○ Notebooks

APPENDIX 6: CONCEPTUAL AND THEORETICAL FRAMEWORK

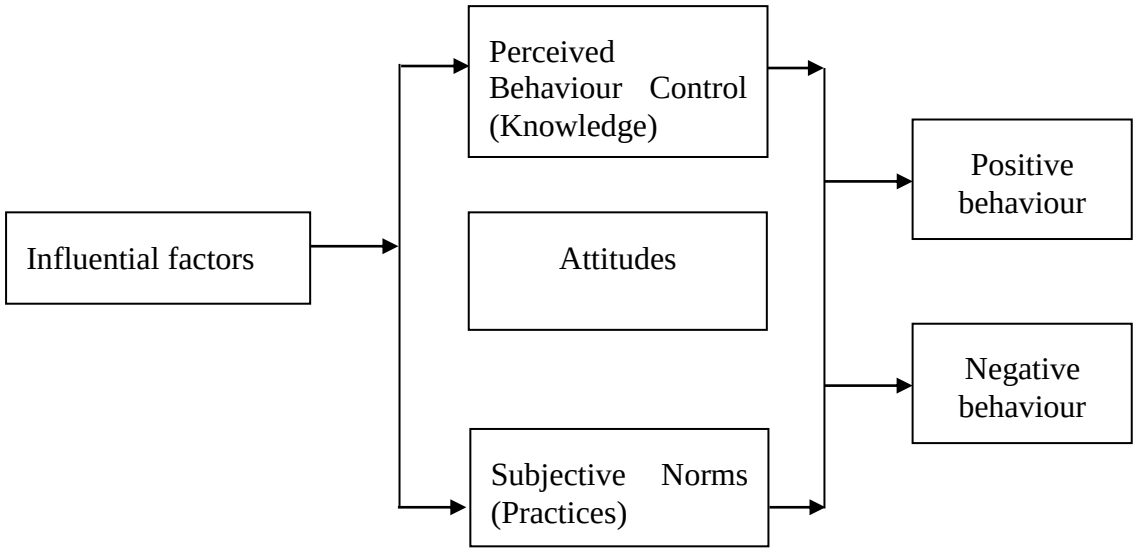

Figure a: Theoretical framework (adopted from Azjen's Theory of Planned Behaviour)

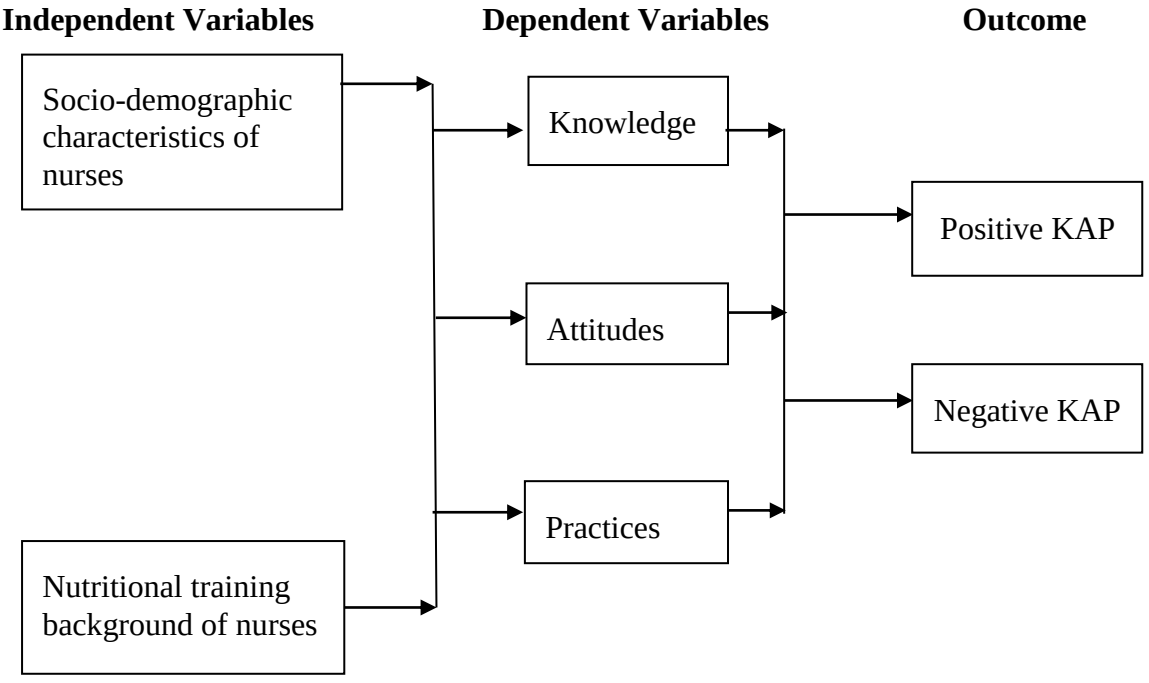

Figure b: Conceptual framework (modified from the theoretical framework)

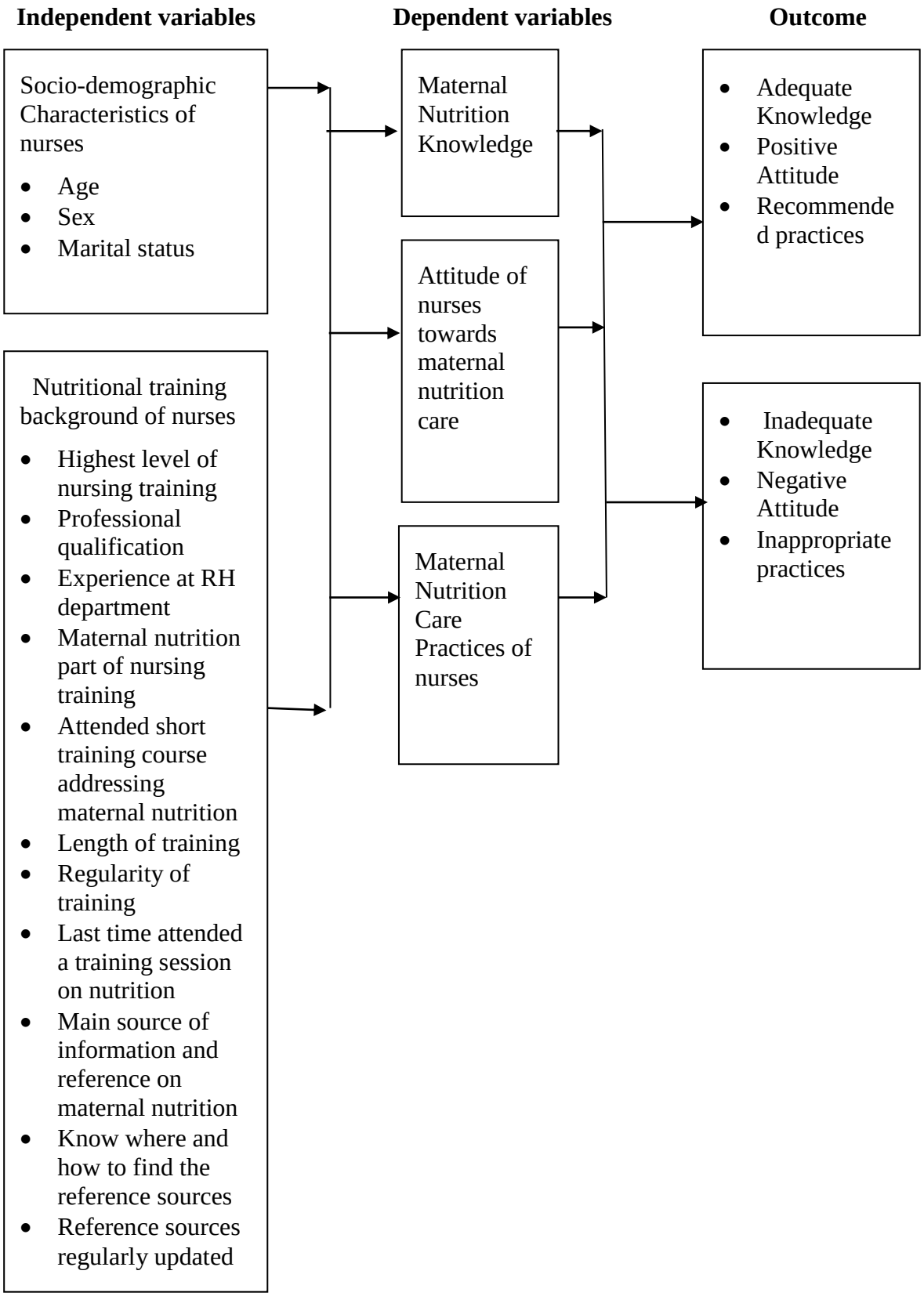

Figure c: Operational framework (derived from the theoretical and conceptual framework)

APPENDIX 7: RECOMMENDED WEIGHT GAIN DURING PREGNANCY

Table 1: Weight gain in singleton pregnancies

The following table shows the rate and total weight gain recommended for singleton pregnancies based on a woman's pre-pregnancy BMI (adapted from: IOM, 2009).

Pre-pregnancy BMI (Kg/m^2)	Mean rate of weight gain in the 2nd and 3rd trimester	Recommended total weight gain
	kg/week	kg
BMI < 18.5	0.5	12.5 - 18
BMI 18.5 - 24.9	0.4	11.5 - 16
BMI 25.0 - 29.9	0.3	7 - 11.5
BMI ≥ 30.0	0.2	5 - 9

Calculations for the recommended weight gain range assume a gain of 0.5 to 2 kg in the first trimester (Siega-Riz et al., 1994; Abrams et al., 1995; Carmichael et al., 1997). A lower weight gain may be advised for women with a BMI of 35 or greater, based on clinical judgement and a thorough assessment of the risks and benefits to mother and child (Crane et al, 2009; Oken et al, 2009; Hinkle et al, 2010).

Table 2: Weight Gain in Twin Pregnancies

The following table shows the IOM (2009) provisional guidelines for total weight gain in twin pregnancies based on a woman's pre-pregnancy BMI.

Pre-pregnancy BMI	Recommended total weight gain (Kg)
BMI 18.5 - 24.9	17 - 25
BMI 25 - 29.9	14 - 23
BMI ≥ 30	11 - 19

There is insufficient information to develop guidelines for underweight women carrying twins (IOM, 2009).

These provisional guidelines reflect the interquartile (25th to 75th percentiles) range of cumulative weight gain among women who delivered twins, who each weighed ≥ 2,500 g on average at term (IOM, 2009).

Table 3: Weight Gain Distribution

The table below shows weight gain distribution of a pregnant woman at term (adapted from: Hytten, 1991).

Weight from	Grams
Fetus	3294 g
Placenta	644 g
Amniotic fluid	795 g
Blood volume	1442 g
Uterus	970 g
Water	1496 g
Breasts	397 g
Fat stores	3345 g
Total weight gain	**12.4 kg**

APPENDIX 8: SAMPLE NURSING TRAINING SCHEDULE

UNIVERSITY OF NAIROBI BACHELOR OF NURSING COURSE OUTLINE

Level: Non Specified

Semester: Non Specified

Course Code	Course Name	Course Hours
HNS201	Reproductive Anatomy And Physiology	68
HNS210	Educational Psychology	
HNS 307	Research Methodology	
HNS107	Community Health	90
HNS301	Educational Communication And Technology	
HNS302	Medical / Surgical Nursing Ii	360

Level: 1

Semester: Non Specified

Course Code	Course Name	Course Hours
HNS104	Nutrition And Health	90
HNS105	Fundamentals Of Nursing	270
HNS102	Medical Physiology	200
HNS106	Psychology	68

Semester: 1

Course Code	Course Name	Course Hours
CSO101	Introduction To Sociology	45

Semester: 2

Course Code	Course Name	Course Hours
CSO102	Introduction To Anthropology	45

Level: 2

Semester: 1

Course Code	Course Name	Course Hours
HNS101	Human Anatomy	30
HNS204	Haematology	45
HNS205	Basic Statistics	45

Semester: 2

Course Code	Course Name	Course Hours
HNS202	Medical Microbiology	135
HNS203	Clinical Chemistry	67
HNS206	Medical Surgical Nursing I	450
HNS207	Clinical Pharmacology & Pharmacotherapeutics	180
HNS209	Family Health Nursing	150
HNS303	Paediatric Nursing	270

HNS304	Community Health Nursing I	270
HNS305	Mental Health And Psychiatric Nursing	315
HNS306	Midwifery/obstetric & Gynaecological Nursing	26

Level: 4

Semester: Non Specified

Course Code	Course Name	Course Hours
HNS401	Medical Surgical Nursing Iii	540
HNS402	Management And Administration Of Nursing Services	270
HNS403	Curriculum And Instruction In Nursing	270
HNS404	Research Project	90
HNS406	Community Health Practice	270

Nutrition and Health description: Define nutrition science; Discuss historical development of nutrition science; Carbohydrates, Protein, Fat/Lipids, Vitamins, Minerals, Water; For each nutrient: Define the nutrient, Classification, Functions, Digestion; Absorption, Metabolism, Excretion, Sources; Requirements. ; Define Energy Metabolism.; Units of energy measurements in foods.; Food as sources of energy.; Factors influencing energy needs; Energy balance Importance of a balanced diet, Components of a balanced diet.; Diet planning principles, Diet planning tools, Menu planning.; Food budgeting, Food purchasing.; Food preparation and handling.; Define food security; Food security at family and community level; Production, Storage, Distribution, Marketing, Pricing;, Define nutritional status and its importance; Methods of nutritional status assessment ; Anthropometry, biochemical, clinical, dietary history, psychosocial, vital statistics, psychomotor development.; Normal weight.; Underweight, Overweight, Obesity and their determination.; Nutrition in growth and development; Nutrition during pregnancy and lactation; Nutrition for adults and the aged; Chronic diseases of nutrition and their dietary management.; Diabetes Mellitus; Diseases of the Heart, Hypertension; Renal Diseases; Cancer, HIV/AIDS, Tuberculosis; Anorexia Nervosa; Bulimia; Gastrointestinal diseases and their dietary management.; Problems of the mouth and oesophagus; Small intestine diseases, Large intestine, Peptic ulcers; Liver diseases; Surgical conditions and their dietary management; Nutritional management before and after surgery.; Nutritional management of burns patients.; Nutritional services for the hospitalized clients/patients.; Management of dietary services.; Dietary services for patients, Types of hospital diets, Enteral and Parenteral nutrition.; Hospital nutritional quality assurance; Nutritional care process; Nutritional counselling:; Nutritional care plans; Nutrition education principles. Principles of nutrition education, Teaching methods in nutrition education; Nutritional deficiency; Define malnutrition; Classification of malnutrition, Protein

energy malnutrition.; Xeropthalmia, Pellagra, Scurvy, Beriberi, Nutritional Anaemia, Endemic Goitre.; Rickets, Dental fluorosis, Osteoporosis; Nutrition in health promotion.; Effects of drugs on nutritional status; Role of nutrition in physical fitness.; Role of nutrition in stress management.

APPENDIX 9: STUDY FINDINGS DISSEMINATION PLAN

1) I will avail a copy of the final report of this dissertation at the University of Nairobi's library for reference by other scholars interested in the information herein.
2) I will avail a copy of this report at the Research and Programs department at KNH for reference by health workers at KNH and other scholars.
3) I will hold a briefing session for all ward and unit in-charges in the Reproductive Health department, to share the study findings and deliberate on appropriate approaches to address the gaps in maternal nutrition care practices of nurses identified during the study.
4) I will publish this study in a peer reviewed journal to disseminate the findings.
5) I will submit the abstract of these study findings to local and international conferences to share the information herein with other scholars and professionals.

APPENDIX 10: SIMILARITY INDEX REPORT

Turnitin Originality Report

KNOWLEDGE OF MATERNAL NUTRITION, ATTITUDE AND PRACTICES AMONG NURSES AT KENYATTA NATIONAL HOSPITAL, KENYA

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APPENDIX 11: LETTERS OF ETHICAL CLEARANCE AND STUDY APPROVALS